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Vol. 1

THE KANSAS CITY REVIEW.
of Science and Industry

AUGUST, 1885.

THEO. S. CASE, M. D., | EDITORS.
WARREN WATSON |

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THE KANSAS CITY REVIEW,

of Science and Industry

DEVOTED TO

Science, Art, Indusrty and Literature,

VOL. IX. NO. 1.

THE RELATIONS OF ARCHÆOLOGY TO HISTORY.

Archæology, as far as its scope has been in any way defined, stands midway between paleontology and history, and seems to encroach somewhat upon the territory of both. The relation it bears to history seems to consist in matters of interpretation. The highest conception we can form of history is, that it should be science; something that we can conjure by, something that we can prophesy by. And science is the exact co-ordination of the human brain to the phenomena that surround us. We may give the same definition to knowledge, since all knowledge in its last analysis is the same, although the subjects of knowledge may be different. If history is to be looked upon as a series of annals, recording the wars of different people or the exploits of different chieftains, archæology has very little significance. If we could get possession of Arthur's sw[illegible] Excalibur, or the horn that summoned Charlemagne back to the slaugh[illegible] of Roncesvalles, we could not write the annals fuller than they are. If, however, we look upon history as a branch of physiology, archæology acquires an importance that cannot be overestimated. And how is history a branch of physiology? Physiology takes up the history of the different organs of the human body, shows what their functions are singly, then what their effects upon each other are when acting together as the perfect man. There it leaves him. But beyond this, man's life goes on in the same physiological line. As every one of the different organs of the body is a unit helping to form the mass, so every individual becomes a unit, or molecule, helping to form the mass of society. In this position he is held by laws of cohesion, and laws of growth which affect the whole mass; so that the nation must be looked upon as an organism, or a tissue, with a general vitality which animates it. Say what we like about mind and vital force, they appear before us in all their phases, as resulting from a physical basis, and through this physical part of them they are able by some subtle chemistry to draw further power of their kind from nutrition. When we reflect that the varying moods of the most spiritual mind, its exaltation or depression, its stupidity and its clearness, are the results, all through life, of this process of nutrition, it must become manifest to us that some material law here directly impinges upon the spiritual. In no position, however, to the superficial observer, does man appear so much a free agent, so much a law to himself, as when acting in connection with other men. When a person of very great energy arises and seems to dominate and direct his age, it is with diffi [illegible] xponent of his time. W [illegible] volcano makes the erup [illegible] No one man is particularly necessary to the age in which he lives, but the age is particularly necessary to the man. The reformation made Luther; the revolution of '93 made Napoleon. A hundred years either before or after would have made them different men. Luther might have been a fanatic, burned at the stake for his honesty and plain speaking; Napoleon might have become an outlaw hunted by the troops of the grand monarch in the mountains of Southern France. The time demands an expression, and the man is pushed ahead and converted into a hieroglyph. It is nature's writing. The hieroglyph is nothing, but it symbolizes everything.

These crises which drag the individual into prominence usually mark some disturbance which interferes with the nation's growth and development. If we could imagine several communities of men, each born and reared under the same conditions, exposed to the same atmosphere and living on the same soil, their histories would be the same. With a little more knowledge of disturbing causes, even the history of the nations of to-day might be written impersonally. This is certainly all that can be asked of history in the highest sense of the term. To mark out the ideal line of progress under given conditions, to approximate to the reasons of variation in any particular nation, this is all that we can expect. More than this must be given over to the annalist and the antiquary, and really we do not lose much by doing this. We can learn more of humanity from the novel of to-day than from all the annals of ancient Rome, and, apart from the curiosity we might have, it would benefit us more to be introduced to the living chieftains of the Zunis than to all the Pharaohs whose mummies have been unearthed.

For convenience the process of national development has been divided into stages. We have the savage, the barbarous, the civilized nations, etc. It is needless to numerate all the degrees of enlightenment given by ethnologists. To a certain extent they all seem to me unphilosophical, inasmuch as they start simply from a comparative basis. Not much better it seems to me is the division into stone, bronze and iron ages, yet it is almost necessary to have some terms by which to designate the different stages of development. The division is rendered especially difficult from the fact that nations like individuals have their special lines of adaptation. The English are especially adapted to trade and manufactures; the Germans to patient, laborious, scientific investigation. Yet we cannot say that one of them is further along on the road of civilization than the other. Why do we think that Americans are further advanced than other nations? Simply because we have invented many labor-saving machines, and have developed the resources of a continent in a wonderfully short time. Yet other nations think as well as we do and form for themselves fully as lofty ideals. I am not certain that triumph over nature in the way we have achieved it, is always an advantage, for the multitude of servants is not always an index of the elevation of the master. The tremendous physical forces which a single man now summons to his aid may threaten us with a speedy return to barbarism, for certainly the morals of a railroad corporation are no improvement on those of Confucius. The Brahmin, whose metaphysics and philosophy were old when Greece was young, is fully a match for the Western missionary who takes with him the newest theology, and the latest scheme for reconciling science and divinity.

Comparisons like these might be made indefinitely and in the end they would be unsatisfactory. The only thing to do then is to take the brain as the map of the man or nation, and apply the process of exhaustion. In regard to any nation let us ask how far the potential activities of brain power have been exerted. So far as known man is the burning point in which the rays of vital force meet and focus. He is not exactly a microcosm, or epitome of the world, but he is a centre from which the world re-acts upon itself. All his activities are in a way reflections, responses to irritations from outside things. These irritations are responded to by work, and work of all kinds marks itself upon the face of the world. A nation passes over a land like a glacier and when it disappears it leaves its moraines in every direction. A country long inhabited by a civilized people has a different appearance from one just settled for a hundred years or so. It acquires a domesticated look, like that of a wild animal that has been tamed. The sharp angles of the landscape melt gradually into graceful curves, the people and the country seem to grow nearer to each other as if they mutually made concessions, the farm houses and villages nestle into the land as if they naturally belonged there. This subtle harmony of long habitation and mutual understanding is one of the first things to observe in visiting Europe. Man does not seem there like an interloper, like a hostile power come to do violence, as in many places here; even the grey ruins perched upon cliffs have their rough angles veiled with vines and mosses, as if nature, like a mother, were desirous of screening from view the deformities of the child she nursed. In this nearness of communion, there seems to be no reason why the race should not live on and on until the end. But what is the end? There is no law of limitation with man except his capacity to take; there is no limitation to nature except her capacity to give. There is every reason to suppose that the highest development of man is capable of exhausting all the means the earth can offer for his support. Whether man has yet reached the maximum of his powers in any one instance, whether the crowning nation of the earth has yet arisen may be matter for question. Up to this time nations have died by assassination and their blood has but enriched the earth, but already we begin to see that the track of the Anglo-Saxon is more destructive than a conflagration. Should the English die out from England in the natural way the island will be left behind like a rubbish heap in the sea. The coal, the iron, the tin will be exhausted, and a few half savage fishermen will spread their nets over shell heaps where the Thames now wanders to the mists of the German ocean.

Now what relation can archæology bear to history written in accordance with the ideal I have sketched? There can be only one answer. It is the geology of history; it furnishes facts for history to interpret. It holds up a bushel of arrow heads; they are nature's cuneiform inscriptions. It shows a lap full of broken pottery, covered with fanciful designs, twisted into outlandish shapes. These are the broken symbols of ancient ideas, the speechless records showing that a peculiar kind of man lived and worked. It has been said with more of epigram than wisdom, that barbarous nations have no history. In the sense of written annals perhaps they have none. In another sense they have one more important because it contradicts the annals. From the structure of our intellects we are obliged today to confront every fact with a question. It is an inspired curiosity arising from the necessities of our nature, and the first question asked at the commencement assails us now as then. That question is, Whence? The answer of the annalist was an inscription which closed the door of thought by saying that man at no remote period descended from the gods. The answer of archæology to this question is an arrow head dug from beneath the alluvium, or the picture of a reindeer drawn upon the half rotten tusk of a mammoth. Of course I have not time in this short essay to go into the question of interpreting the facts. I think we have not yet the means at hand to do this conclusively in all instances. There is some show of truth in the argument that opportunity must figure largely in the instruments that a man must use to attain his ends. If he live in a country full of metals, where the conditions foster civilization, and yet has only bone implements and arrows, tipped with flint, he must indeed be a savage. If he live in a rough barren country where there are no metals, and use the same weapons he may be yet far removed from savagery. Such a man we can imagine chanting sublime poetry round his camp fire at night, or talking in terms of a deep philosophy. Not much can be argued, however, from the uncertainty of the record, for it certainly is no more untrustworthy than the annals which Niebuhr discarded when he re-wrote the history of Ancient Rome. As regards the archæology of recent times there is nothing more to say. Herculaneum, Pompeii, the roads, the acqueducts, the paintings on the walls of Karnak, the sculptures in the palaces of Sargon—these are fossils which introduce us almost as closely to the times as eye witnesses could do. What they have been to history any one knows who has seen how history has been re-written, during the last quarter of a century. It is not so much the heroes who have suffered. We have not dethroned Sesostris or Nebuchadnezzar, but we know more how the common people lived, how they bought and sold, how firmly the foot of the monarch was planted upon the neck of the people.

INTELLECTUAL LOVE.

"Love, love, what is love?" is the inquisitive refrain of a familiar ditty; but the only answer it gives to the old, old riddle is—"Love is what makes a man feel so peculiar." Doubtless most of us can heartily testify to the truth of this statement; yet do we approach any nearer to the arcanum where Love resides through our peculiar emotional experiences? Can such answers, whether dictated by gravity or gaiety, put aside the enquiry into the nature and source of Love? Our experiences are only mysterious shadows on the mirror of life. We watch them, like the Lady of Sharlott, as they pass and repass, with no power to do otherwise though the key to their origin seems near by. To those who are satisfied with a physical explanation for every phenomenon of life, who tell us with consequential dogmatism that the material world contains all the potencies that can possibly operate on consciousness, these shadows have no deeper significance than the ripple marks of a wave on the ocean beach—exposed to the eroding contact of the next wave or to be hidden under the shifting sands. To such philosophers the admonition ot Emerson is addressed: "Let us be silent that we may hear the whispers of the gods."

It is indeed difficult to define Love. La Rochefoucauld expressed the general opinion in his definition. "All we can say," he asserts, "is that in the soul it is a desire to rule, in the mind it is a sympathy and in the body it is a hidden and delicate wish to possess what we love—plus many mysteries." But this definition, adopted even by lexicographers, leaves a world of occult, yet potential, motivities to be apprehended only through the flippant words "plus many mysteries." It is these very mysteries which need definition and which have attracted from time immemorial the highest flights of the human intellect in endeavors to make manifest to man. Beyond these "many mysteries" the definition comprises little of the characteristics of the passion besides its sensual incidents, and it is doubted whether any of these incidents are really related to love. In truth there has always existed a school of perfectionists which holds that the sexual instinct, as well as all other purely selfish passions are antithetical to the genuine emotion of love, and are clogs and obstacles to its free and noble course. They claim that the essence of love is purity, and that breathe one unhallowed breath upon its flame

"And it is gone forever, and but leaves
A sullied vase—its pure light lost in shame."

This school scornfully denies that that passion or instinct in man and beast which is the most prolific source of cruelty and selfish brutality is in any way related to the holy passion.

In its creed "love is the great instrument of nature, the bond and cement of society, the spirit and springs of the universe." From its view the ancient myth which makes Love the primeval father of gods and men as well as the source from which emenated the perceptible universe, is no idle tale. And it cannot be doubted that behind this antique teleological conception there lies an irrepressible and universal idea,—an idea that the perceptible universe manifestly imperceptible in itself, is yet, for us, given form and substance, given all the attributes by which it may be apprehended, by some such harmonizing influence as an all-pervading Love; in the absence of which the sensuous world would fleet into nothingness like a mirage of the desert. The content of his idea is not peculiar to antiquity nor is it confined to one race or one civilization. It is the acna or akasa of eastern rhapsodists; it is the astral light of the alchemists and theosophists; it is the psychismic fluid of Quesne; it is the psychic force of Crookes and Varley; it was no more the underlying spirit of the widespread ancient mysteries than the *Deus ex machina* of many speculative systems. Thus DesCartes posits a divine uncreated substance as the mediator between mind and matter, and Leibnitz must needs call in the assistance of a pre-established harmony to bring his monads into orderly connection. Hence it will be seen that the many mysteries of Love cover an illimitable field,—a field full of fair blossoms and untasted fruit, whose full harvest we must despair of garnering and be content to bear away a handful of its wealth as evidence that we have discovered the hidden territory.

It is with one expression alone of this universal intuition that we have to do; the old, old doctrine that an all-pervading essence establishes affinities among psychological units just as it does among physical elements. Not that all individuals are affected alike; though this universally diffused essence may animate equally all living beings yet it may be hampered in its influence by the incidents of disposition and habit. Some are brought together so powerfully that, though continents and oceans intervene, nothing can keep them apart; others so feebly that living in the same village and jostling each other every day, they live and die but dimly conscious of each other's existence. It is even contended that the gods and goddesses themselves have been created only to furnish lofty objects upon which to lavish a mystic passion whose real object belongs to real life though undiscovered and perhaps undiscoverable. Nay, there are those who insist that a real object is unessential to love; that the true lover

"Is in love with an ideal,
A creature of his own imagination,
A child of air, an echo of the heart."

There have been many notable examples of this beatific passion and many noble expressions of it in literature. The stories of Petrarch and Laura, Dante and Beatrice, rise at once into recollection as expressions of a purely intellectual passion which make the heart ask itself a thousand questions more inscrutable than the riddle of the Sphynx. That Laura was a real woman, and married at that, there is no room to doubt. That she treated Petrarch with distant courtesy and that they enjoyed no intimacy are facts which cannot be well gainsaid. Yet for twenty-one years during her life, the poet celebrated his ideal passion in a series of sonnets which have immortalized both; and after her death the passion lingered in Petrarch's bosom, more tranquil and calm, more grave and tender, but not less strong than when Laura lived to inspire him with her presence. After she had passed into the ideal world, the paradise of the god whose name is Love, the poet pictured her as waiting for him there full of pity and tenderness and offering an eternity of love in recompense for his constancy. Now was this over-mastering passion a mere sentiment, a fantastic or morbid impulse, a whimsical expression of the sexual instinct, or was it dictated by the adoration of an ideal affinity personified in Laura,—an affinity which would perhaps have taken flight at the approach of sensual desire? I believe that the coarsest natures, even, derive more genuine pleasure from the pursuit of desire than in its gratification. There is ever flitting before us a phantom pleasure, and in our anxiety to clasp it we are led to satisfy ourselves with the basest of counterfeits. And then we cry out against love as though our miserable gratifications were the genuine raptures we had sought. I believe also that if Petrarch and Laura had been brought together under circumstances more encouraging to the gratification of sexual instinct, the beatific emotion would have departed, shamed from the poet's heart.

"What is Love? 'tis not the kiss
Of a harlot-lip—the bliss
That doth perish
While we cherish
The fleeting charm; and what so fleet as this?"

There is a passage in the Confessions of Rousseau, startling in its candor and unconventionalism, that describes the destruction of such an ideal by its merger with sensual gratification. Madame de Warrens, whom he had adored without stain of desire, unexpectedly offered him the last favors of love; but even as he clasped her in his arms a revulsion of feeling came over him, his ideal passion fled away forever and he deluged her bosom with his tears. Owen Meredith expressed more poetically the same feeling in his little poem entitled Possession:

A poet loved a star,
And to it whispered nightly,
"Being so fair, why art thou love so far?
Or why so coldly shine who shinest so brightly?
O Beauty woo'd and unpossessed,
O might I to this beating breast
But clasp thee once and then die blest."

That star her poet's love,
So wildly warm, made human.
And leaving for his sake her heaven above,
His star stoop'd earthward and became a woman.
"Thou who hast woo'd and hast possessed,
My lover, answer, which was best,
The star's beam, or the woman's breast?"

"I miss from heaven," the man replied,
"A light that drew my spirit to it."
And to the man the woman sigh'd,
"I miss from earth a poet."

In the Vita Nuova and the Paradise of Dante, we find another expression of the purely intellectual passion. The girl of sixteen, whom Dante had vainly loved, inspired him with an ideal yearning which survived marriage and paternity and grew stronger and purer in the midst of adversity and the approach of age. She became apotheosized in his thoughts but personified not so much the attributes of Cytherea as those of the Virgin Mary. Plato had taught that love is an initiation into the secrets of the spiritual world and Dante rediscovered this teaching and gave it to us in a comprehensible form. In the Divine Comedy his own inspired genius, personified by Virgil, suffices to conduct him safely through the horrors and jeopardies of retributive justice, but it is love alone, in the form of Beatrice, that can guide him into Paradise.

This Platonic idea has received expression from an oriental source: The Song of Govind translated from the Sanscrit by Edwin Arnold, is a little pastoral drama, in which, under the form of Krishna, the human soul is displayed struggling between the opposing powers of intellectual or spiritual love and sensuality. Radha, the genius of spiritual love, discovering Krishna in a forest dallying with wanton shepherdesses (personifications of sensuality), listening to their music and laughter and succumbing to their voluptous temptations, determines to rescue him from the shame and folly of such a life. She glides into the group of voluptuaries and

"Touched Krishna with a soft mouth, kind and cool."

Though she comes to him as a vision and not as flesh and blood, yet her presence as the ideal of his heart, causes him to forsake the gay partners of his pleasures and seek for Radha and grieve with self-contempt over his follies. In the delicacy of his portraiture the Indian poet has seized upon the unselfish character of spiritual love. Though Rhada fears that her efforts are unavailing for the time, yet she does not condemn Krishna; she says:

"He shall be left wholly to his choice,
Free for his pleasant sin,
With the golden-girdled damsels
Of the bowers I found him in."

She knows that at last he will return and once tasting the superior joys of the love she offers will never again be satisfied with mere sensuous gratifications. He does come at length and, having repented bitterly, the sinful human soul is forgiven and is united to Radha, and in that union finds no bliss lacking that could be desired.

But there is perhaps no truer expression of this ecstatic passion than in Shelley's Epipsychidion. The Emilia of his poem was a mere woman; yet the exaltation of sentiment with which he addresses her surpasses the idealism of Petrarch and the ecstacy of Dante. She becomes under his inspiration a western Radha. While you read his enthusiastic and glowing lines it is easy to forget that the object of his adoration is a mortal. She becomes a goddess—a Greek divinity worshipped with all the gentle flattery and fervor that humanity ever bestows upon its female gods. Every verse is a cry, every sentence a prayer. He speaks of that ideal shape which the fancy creates and presents to the soul as the only true embodiment of love; of his rash search "in many mortal forms" for the shadow of that idol of his thought; of the fair, the wise and the true, who passed before him, and, at length, of his discovery in Emilia of the affinity which his soul had for so long time pursued. And then wreathing together a wilderness of quaint conceits into a chaplet for his Lady Fair,—expressing the very language of love in a torrent of passionate words, and describing the Paradise that awaits them, he tells her that there

"We shall become the same, we shall be one
Spirit within two frames. Oh! wherefore two?
One passion in twin hearts, which grows and grew,
Till, like two meteors of expanding flame,
Those spheres, instinct with it, become the same,
Touch, mingle, are transfigured; ever still
Burning yet ever still inconsumable.

* * * * * * * *

One hope within two wills; one life, one death,
One heaven, one hell, one immortality,
And one annihilation."

Now what think you of this refined passion which, for want of a better name has been called intellectual Love? Shall we be content to regard it as a mere sentimentality? Or is there a genuine motive beneath its unselfish promptings, its rhapsodical and romantic philosophy, its lofty ideals and inspirations? Are these simply refinements of that incentive throughout animated nature which attends upon the propagation of life? Or is there a "Celestial Harmony," such as old Spencer imagined, independent of every material or sensual spur, which pervades our beings and arouses the "longings infinite" of intellectual love? For myself I am inclined to say with the Bard of Abbotsford:

"It is not Fantasy's hot fire,
Whose wishes, soon as granted, fly;
It liveth not in fierce Desire,
With dead Desire it cannot die;
It is the secret sympathy,
The silver link, the silken tie,
Which heart to heart and mind to mind
In body and in soul can bind."

THE INDUSTRIAL ACHIEVEMENTS OF THE ANCIENTS.

It is common for us to magnify the creations of modern genius and to look upon them as *sui generis*, the first of their kind. The steam-engine, the telegraph, the power-loom, the iron ships and bridges, the instruments of science and industry, surely had no prototypes in the ancient world! Even while we admit engineering and architectural skill to the Mesopotamians and Egyptians, we feel that, after all, these people were barbarous compared to modern civilized man; and our admiration consists chiefly of wonder that such marvelous feats were achieved by such immature efforts. The pyramids are stupendous, certainly, but how useless! The barbarism of their builders could not be better shown than by a comparison of the value placed on human labor then and now. Would thousands of human beings be employed now in the silly labor of building a King's tomb? Hundreds of thousands of men, but a few years ago, followed the beck of a Napoleon to perform achievements quite as great and far more senseless and cruel.

But there is much to be said in behalf of ancient industrial knowledge. From whence came nearly all of our common and necessary vegetable foods and most of our domesticated animals? So anciently were these familiarized to man that no one felt sufficient curiosity to explore their origins; and no record has been left of the time or place the first uncultivated plant, or the first wild animal, became tributary to human necessities and pleasures. Surely the first man who discovered the uses of the horse and tamed this noble animal to pull his chariot, or bear him to the chase, was as great a benefactor to mankind as Watts or Stephenson; yet the most ancient chronicles are silent about him. The grains of wheat found entombed with Egyptian Mummies, and in the funeral vases of Babylonia, or amongst the debris of lacustrine villages in Switzerland, are essentially the same as those sown by the farmers of to-day; and yet no observer of ancient or modern times has ever discovered this grain growing in a wild state. It might be thought that maize, so lately made known to Europeans, can show a definite origin; but so old is this valuable grain to the use of man that nowhere, over the vast domain of America, has a wild species been discovered. Some time in the remote and unchronicled past, a benefactor of his race saw the feathery tassels and glossy blades of a new plant rise amidst the foliage of a sedgy river bank, and under his intelligent care this became the maize of commerce; yet not even tradition preserves his name except in unintelligible myths. The same might be said of many of the most important products of the soil. Among fruits, the peach—in whose name its ancient home is traced—is older than the oldest historian. The banana, alike in America and the old world, can only be propagated by cuttings; artificial propagation, through long lapse of time, has made it destitute of seeds and the plant from which it sprang has disappeared from the spontaneous vegetation of the world. In all the wide range of human foods, derived from either the fields, the orchards, or the pastures, the few which are not heritages of a past that is in no man's memory and remains unchronicled in books are of insignificant importance to the world.

But it is not alone the *products* of agriculture that we must credit to prehistoric sagacity and prevision; the art of *cultivating* them was known and practiced to a marvellous degree among the most diverse nations. The Chinese, the Mesopotamians, the Egyptians, the inhabitants of India, even the Aztecs of Mexico, had discovered, or inherited from still more ancient peoples, many of the secrets and methods of the modern farmer. Painted on the temples along the Nile, we can see representations of Egyptian farmers, plowing their fields, sowing, reaping, threshing and grinding grain,—all with a skill most unmistakable. As the horse, the ox, the sheep, the goat, the dog and the cat came to us completely civilized from prehistoric times, so did the methods and the products of agriculture. It is even contended that the ancient Gauls invented a reaping machine on wheels, with which they reaped their grain. In China our threshing-machine was anticipated, and even the claims we make for the invention of the mold-board plow is endangered by some figures in the wall sculptures of the east.

The uses of domesticated animals seem very apparent to us now, but a little reflection would show that the sight of wild herds and flocks will not necessarily suggest these uses to one who has never heard ot them. The fact, then, that the use of cow's milk, for instance, is of such remote commencement that one of the nearest and dearest family relations among Aryan nations, is named from it (the word daughter orginally meant "the milker,") goes far to show the antiquity of bovine domestication. In Egypt the modern incubator was anticipated as early as the days of Menes, and the epicures of that day were equally as well served in this respect as those of the nineteenth century.

Who invented weaving? Who first discovered that the flossy coat of the sheep, the wings of the cotton-plant seed, the fibers of a tough weed, the sorcophagus of an insect, could be wrought into garments more comfortable than the foul and cumbrous skins of beasts? Myth and fable may be valuable enough but the true history of these discoveries remains as inscrutable as the history of the alphabet. Three-thousand years before Christ the Chinese and Indian annals tell of the manufacture of silken fabrics; and the monumental remains on the Euphrates and the Nile show the weaving and use of various kinds of cloth from animal and vegetable tissues. Even in the yet mysterious mounds that are encountered on every river-course in the Mississippi Valley, the weaver has left the record of his skill. The potter, too, was an adept in his art ages before Alexander crossed the Hellespont; and along with his skill and intelligence belonged an artistic excellence not accorded to his modern successors. In China and Japan, where civilization, such as it is, has been continuous for ages, the art of the past is the despair of the present. They cannot now produce the pottery which the ancient masters fabricated. The merest tyro knows that the metallurgical skill of the ancients has not been surpassed, even with the newly found appliances of modern times. Indeed there were some combinations of metals, useful as well as ornamental, like electrum and the hardened copper used by sculptors and stone-cutters, which we have lost the secret of making. The bricks and tiles of Egypt and Mesopotamia, after ages of exposure to the elements, testify to the skill and intelligence of their makers; and the cement with which they decorated or protected their pyramids, temples and palaces, is as enduring as granite. The mechanics of Babylon and Thebes, of China and Tyre, could achieve from proper materials the same results as modern artizans. In Cyprus and Asia Minor, in every seat of ancient culture, explorers have brought to light, from sepulchers and ruins, specimens of ancient skill in the manufacture of household implements and ornaments, quite as finely, and far more artistically wrought than similar products of our day. It would be useless to refer to the manufacture of arms and armour, of leather, of the thousand necessary conveniences of life. Glass is found in tombs three-thousand years old and in forms and fabrics unequalled by contemporary labor.

We boast of modern feats, of the Mont Cenis tunnel, of the Suez canal, of the Pacific rail-roads, of the Brooklyn bridge; can the ancients claim anything to compare with these? Laying aside the pyramids, whose gigantic blocks of granite were conveyed from the quarry over two-hundred miles down the Nile, even then there is little left to vaunt ourselves about. Amenemhat, an ancient Pharaoh, saw what a benefit it would be to agriculture if the surplus over-flow of the Nile could be stored for future use and prevented from flowing into the sea; so he excavated a lake, fourteen miles in length, eleven in width, from which the vivifying waters were disributed along irrigating ditches to the farmers. Rameses the Great anticipated de Lesseps, by constructing a canal which connected the Red Sea with the Mediterranean, and this canal was greatly enlarged by Necho. Nitocris built a bridge over the Euphrates at Babylon, and, instead of sending laborers to the bottom of the river, in dark caissons to scratch up puny handfuls of sand, he diverted the great river from its course, like a god, and, when his bridge was finished, permitted it to return to its natural channel. In Peru, China and India there were aqueducts aqual in length, and the engineering skill employed, to any now extant; while the great wall of China and the roads of Peru equal anything the present age has produced.

Who was the ingenious inventor that first adpated the properties of the magnet to the use of those who go down to the sea in ships? History relates that Gama first learned of the compass from Mohammedan pirates whom he encountered at the Cape of Good Hope. Where did they get their knowledge? They must have inherited it from navigators who preceded them on the Middle sea. Indeed it is affirmed that the Phœnicians used a form of the compass (made by placing a small load-stone on one arm of a cross of straw or reeds afloat in a cup of water,) in their voyages. On the prows of Phœnician vessels stood a figure of Ashtaroth, the cross in one hand and the other extended to point the way. An ancient Chinese monarch caused figures to be placed in the front of his chariots which always pointed south. Hercules sailed at night with the help of the cup of the Sun and Abaris, the Hyperborean, was enabled, by the arrow of Pythagoras, to find his way back to the north. And what voyages these ancients performed! A Carthaginian crew sailed westward to a land beyond the Pillars of Hercules and told of the cities and wealth they saw there. Ages before the vaunted feat of Vasco de Gama, old Pharaoh Necho sent his galley through the Pillars of Hercules to circumnavigate Africa and saw them return through the Red Sea. Indeed these ancients were not stay-at-homes; their fleets whitened every sea from the Spice Islands of the East to Iceland, and, perhaps, America. And Great Easterns were not lacking in those days either. Archimedes, of Syracuse, built a ship for Hiero which consumed the materials of fifty ordinary galleys and contained temples, theatres, gardens, stables etc., of ample proportions.

Indeed there is nothing new under the sun. Every invention has grown out of the necessities of the age, not from the spontaneous genius of man. Hero of Alexandria, the inventor of the principle of the steam-engine, or, at least, the earliest to record it, might, and probably would, have developed the invention, had the time demanded it. Whether the wires with which Cleopatra conveyed intelligence were operated by electricity or not, they would have been if society had needed the discovery. Among the ancient mound-builders there was a perfect system of signal telegraphy made necessary by the continuous and savage hostility of the wild tribes of the woods. We have these ultimate products of invention because the time demanded them; but the principles underlying them were known when the oldest Pharaoh was a child; and our knowledge of the skill and intelligence of the ancients justifies the assertion that if these inventions should have become necessary to society, as then constituted, they would have employed these principles in much the same way that our century has employed them.

THE PRIMITIVE GODS.

A purely descriptive treatment of the primeval gods would alone be very interesting. It would lead us into a world of poetry and tragedy and would be full, not alone of beauty but of significance; as showing the workings of the human intellect under circumstances widely different from ours.

Such an attempt would be too ambitious for the purposes of a single reading since it would take us at once into a wide field of myth upon which many learned volumes have been written and many more will be. Our more modest task is a brief inquiry into the principles upon which the formation of mythology proceeded and perhaps into the natural classification of the gods of antiquity.

The notion of god in the human mind, it seems quite certain, came after considerations of animal wants and after some advancement in the methods of satisfying them. Indeed if we may believe the reports of some travelers, there are people still existing who have no idea of a god, no word in their language expresses the thought of a superior invisible intelligence. The mode of genesis of the idea of invisible beings is, of course, wholly within the field of speculation. It seems most reasonable however, and probably most scholars are now agreed, that it is a gradual developement arising, in the first place, from the notion of doubles of living men; and this from the phenomena of dreams. The dreams of the primeval man, subject as he was to sudden and extreme changes of physical conditions, must have been many and vivid. The chase was again gone over, long journeys traversed and distant people seen.

Considering that the body had not moved there must have been another self, wandering about at will during sleep. Death was but a longer sleep, during which, the double of the sleeper might well be supposed to wander about with increased power of working harm on account of his invisibility. That primeval people did not suppose death to terminate the existence of the individual seems to be well attested and is inherently probable from the fact that a child (which is the purest example of an undeveloped mind,) can hardly be made to understand the significance of death. This process continued would soon people another world with invisibles who went about among their former companions intent on good and evil. To a man engaged for the most part in war and the chase they would make valuable friends or formidable enemies and straightway no opportunity should be lost in propitiating by gifts most acceptable. Those who had been most powerful and celebrated in life, the imagination once free from modification by any evidence of the senses, soon clothed with power to triumph for a longer period over spiritual death a nd finally among some peoples, as the Greeks and Romans, they were supposed to be immortal. Thus we have reached a primeval conception of a god by what is called the Ghost theory, which is so well known that it was probably unnessary to repeat it except for symmetry. But it is probably going too far to say that all the primeval gods, or even a majority of them were supposed at one time to have lived upon the earth; although this was undoubtedly the case with the primeval gods of Greece and Rome. The gods of the Egyptians, Indians and Norseman, or a part of them, were *sui generis*, and their origin can be accounted for quite as clearly as by the Ghost theory, by considering a mental characteristic common to men in all conditions. It is alluded to in the following language by Hume: "There is a universal tendency among mankind to conceive all things like themselves, and to transfer to every object those qualities with which they are familiarly acquainted and of which they are intimately conscious. We find human faces in the moon, armies in the clouds; and, by a natural propensity, if not corrected by experience and reflection, ascribe malice or good-will to every thing that hurts or pleases us."

The primeval man lived much nearer to the heart of nature than we, and was well nigh helpless in the grasp of her forces. Philosophy or science he had none. His wants being imperative and constant, every aspect of nature was seen in a purely personal relation to himself. Sickness and health, want and plenty, were distributed by causes unknown. Hence, it was natural that he should see a demon in every adverse, and an angel in every beneficient manifestation of nature that might well be too exaggerated ever to have been a mere human being. So strong is the tendency of man to personify purely natural phenomena, that the most highly developed of the species at this time, with all the assistance of modern philosophy is unable to free himself from it. Who has not cast a look of withering resentment at the grape-vine that tripped him; or heard the demoniacal laugh and seen the defiant look in the torrent that swept away the bridge and barred his progress? And in scientific fact we cannot conceive of a force except in terms of muscular effort. Indeed if we should finally rid ourselves of this characteristic the finest poems in literature would be prose.

The sun, the moon, the sky—stars—winds—rivers—trees—the most imposing aspects of nature were therefore either the very persons or the residence, and peculiar charges of the primeval gods, whatever of their origin, among all peoples and we should expect in advance, what mythology affirms, that the character of these deities varied according to the impression, of different soils, climate and surface configuration in different lands.

Thus a principal Egyptian Deity is Ra or Phra, who represents the scorching hot and flashing mid-day sun of that southern country. He is all-powerful and symbolizes majesty. Their rulers were named after him. Contrast with this, Baldur, the sun god of the frozen North. Baldur, the beautiful, the fair Baldur. Baldur leaves heaven to tread the ways of men and his coming is heralded by Spring time. The sun god is neither powerful nor majestic in that country, but soft and beautiful; and it was in search of him that the Northern hordes poured over Southern Europe.

Thor, as the thunder god amongst the cliffs of Norway, is as "tall as a mountain—his beard is briars, and he rushes to his deeds with strength and frenzy." On the flats of Denmark he wanders along the shore a youth with "golden hair and downy beard." The principal gods of the Southern countries are sun gods, Osiris and Horus; of Chaldea, sky gods; of the north, wind and tempest like Odin. The gods of Greece are immortal. Nature is never frost-locked and dead. They go on forever lightly enjoying life under bright skies. Playing the flute, drinking the juice of the grape or patronizing the fine arts, their mythology is a poem.

With the northern gods life is serious. They are in one continuous combat with the fates, and finally after performing Herculean labors they fall in a desperate and bloody battle. Their mythology is a tragedy. The beautiful Baldur is slain, and even Thor succumbs after a desperate fight with the old woman, Time. There nature constantly reminded them of death, desolation, suffering and harsh battles. Thus we might proceed almost *ad infinitum* to illustrate the plan of the formation of those mythologies which later became so elaborate and intricate.

As we should know, the primeval gods are *ex necessitate*, not creators, as they became in later times; they are simply created finite beings—peculiarly powerful men and women; moreover they are generally inimical to men, for in primeval times to be a stranger was to be an enemy.

It was just as true in primeval times as now that gods are only the flattering image of the men whose gods they are. They are seen as the rain-bow; no two men see the same one.

Whoever has a fair conception of primeval man has a correct notion of the primeval gods. They were not creators with perhaps an exception. The intellects of that time were not sufficiently excursive to speculate about the origin of things. There was no work of that kind to be done and hence, no such labors were imposed on the gods. The gods themselves were too busily engaged in sleeping, eating and fighting to trouble themselves about cosmogony.

There is another element beside the aspects of nature which is potent in determining the classifications of the primeval gods. There are in the human mind two tendencies; one to idolize the deity, to press his attributes up to the farthest limit of thought—a continuing elimination of unworthy attributes—a tendency most perfectly represented by Spencer at this time. But in this process we gradually make God such a far-away being, so majestic and misty and inconceivable, that he is cut off from all sympathy with man or interest or knowledge in his affairs. He is in fact, completely deanthropomorphised. When trouble comes and the burden and heat of the day, man needs a sympathizer and helper, and his god is forthwith brought down to a level of appreciation. These two tendencies exist in all men, and one or the other predominates, according to the temperament, and they mark the distinctions between Religion and Myology, and later between Religion and Philosophy. The divergence lately culminated in the famous discussion between Herbert Spencer and Frederic Harrison. These same opposite tendencies operating in the dawn of Myththology caused two distinct classes ot primeval gods. The first and highest is unapproachable, unchangeable, inconceivable, and even unnamed, among some peoples. He presides over all and inscrutably and mysteriously directs the general destinies. He is Zeus of the Greeks, Dyaus of the Indians, Tyr or the unknown god of the Norsemen, El of the Hebrews. These conceptions approach most nearly to our conception of the Deity. But those gods most known, most loved, and most worshipped, and who filled the largest part undoubtedly of the lives of the primeval men, are the senders ot the rain and sunshine. The gods of the harvest, of battles and of the chase; they are Osiris and Horus, Apollo, Hercules, Odin, Baldur, Thor.

Digressing for a moment at the conclusion it is just as true now as ever in primeval times that there are, when analyzed, different gods. To one, men pray for rain and for immunity from pests and plagues, and for blessings on relations and friends. Of the other they think when they contemplate the grandeur and infinitude of the universe and the omnipresence of law, which knows no good or evil, nor place, nor time.

Such were the primeval gods,—a hoping, fearing, loving, hating, sensuous people who anon filled all heaven with the din of conflict and then swept in clouds and rain over the miserable earth dwellers below. One after another, with the growth of knowledge, they have abdicated in favor ot law, until only one remains; and He, one by one, dropped His special faculties until we have at last the unknowable and inconceivable God, whom even the agnostic does not deny, nay, who is clothed with such impenetrable mystery and majesty by the chief of Agnostics that a new theology threatens to arise from the contemplation of his attributes.

MORAL MICROBES.

The analogy between the laws which govern the material and the moral world, is so frequently noticed that no apology is needed for the acceptation of such similarity.

Physical scientists tell us that germs of the most destructive diseases are originated in the haunts of squallor, and are borne to other surroundings only to lie dormant until favorable conditions develop their activity and they enter upon their work of destruction.

Evidently then, if this be true, the course to be pursued, is, first to purify those localities where such germs are engendered, and, second, to adopt such precautionary measures as will prevent the development of those which may have survived a removal to other localities.

Equally important to the eradication of evil is the effort to trace the prevailing crimes to their sources, and discover if possible, what circumstances conduce to their propagation.

We are all familiar with the narrative from the Report of the N. Y. State Board of Charities, stating that the descendants of one profligate woman have cost the treasury over fifty thousand dollars.

It is highly probable that pains-taking inquiry would reveal many similar records, concerning vast numbers of our prison inmates. But, if we would possess invaluable data, we must go back farther than this, delve deep into the genealogy of that particular woman, find the germ—the moral microbe from which the evil sprung, and then follow up the conditions which surrounded her progeny, and note the development of this small demon into a monster of destruction.

Auguste Comte says "A moral transformation must precede any advance of society." Is it a moral transformation which we effect through the incarceration and punishment of our criminals? It cannot begin with the lowest stratum of society. It is imperative that the seed be sown in the hotbed of civilization, that the growth of purity and regeneration arise in the hearts of our law makers, our home makers, and child trainers, before it can be felt throughout the pulse-beat of the world.

The fashion of the day demands an approximately clean record, but it oftimes proves that he who covers with an appearance of morality the petty vices, is he who is most warmly applauded as a pattern saint.

We are all ready to discover the victims of great sins, to offer a helping hand with a horrified face, an open purse but never an open door, forgetting that perhaps in our own hearts there may at that hour lie dormant the germ, which if not destroyed may give to the world another generation of miscreants.

Every condition is comparative. The degradation of the gutter drunkard who has inherited an unbridled appetite and memories of a besotted parent, is no more a criminal than he who, reared amid refined and clear headed associations, permits an extra glass to befog his intellect. The woman whose public sins are as scarlet, if born with the microbe implanted in her breast, and nourished amid the haunts of vice, has no more cause to blush than the daughter of our highest civilization when she entertains a single impure thought.

'He fits boys to be men,' said an ardent admirer of Dr. Arnold. And nobly he fulfilled his mission!

'Boy' represents the strength and tendency of the preceding generations, plus the power engendered by a new combination of elements. If there is born within his breast a disposition to cavil at evil, to dissemble, to recognize self as the primal object of devotion, to shadow the eye from the glare of the truth, nothing but the companionship and example of persons holding the sternest but the tenderest morality, and filled with the spirit of brotherly love, can prevent the expansion of the evil, until to save itself from immediate danger the State resorts to the old expedient of gathering him within the folds of the penitentiary.

How can the parent who admits two standards of morals, one masculine, the other feminine, ever preserve his son from degrading his manhood? How is it possible for the children of a family to respect the highest type of morality, to reverence the handiwork of the Divine Father unless they are accustomed to think and speak of every law which He has framed, in a spirit of the strictest honor, and with the utmost freedom. To feel that everything which He has created is pure, and that it is our benighted sense which paints it otherwise.

A single shadow of deception darkens the child's whole horizon. He easily detects and instinctively follows the course of his teacher.

What can be more beautiful than the truthful and unrestrained explanation of the mystery of birth, that question which oppresses early youth and to the evasive, or even lying, answers which he receives many a man may date his unholy thought of the most serious relations of life.

There is no greater incentive to purity of purpose than the simple teaching of the little child to weigh his motives. To turn steadily away from the small temptations which surround him and to feel that however young, his lesson of self-control must at once begin. Tender years are no excuse for delay. As soon as a dawning intelligence discriminates between self and playfellow, it is capable of beginning the great work of discipline. If this were a rule of conduct rigidly enforced, who can suppose that the youth of the next generation would indulge in senseless, immoral and vicious courses to the same extent as now?

There is no possibility of over-estimating the importance of a strict moral standard, of a clear personal record, of an ancestry who held themselves above petty vices and self indulgences. But there are thrown upon the charity of the wide world vast numbers of youths in whose breasts the fatal microbe is already planted, and whose only hope of escaping the sin, sowing broadcast the evil within them, lies in the aid which their moral nature receives from their fellow men.

In the building of a Reformatory for young culprits, the right spring has been touched. If the true feeling of brotherly love inspires the hand which directs the work, immeasurable good must result. Sever the offender from immoral associations. Keep about him those influences which are elevating and supremely humanizing. Lead him to forget the temptations of vice by surrounding him with attractions of virtue, and train him to respect himself too much to descend to a lower plane.

The grand point is not alone the abundant supply of wholesome food and healthful occupation, it is the constant presence, as well, of thoroughly interested and companionable persons whose excellent example is not too far removed from the reach of ordinary lads as to be a discouragement instead of an incentive.

A wisely selected superintendant might well be assisted by daily visits from at least one of a board of managers whose heart is in his work; who knows the boy nature and respects it; who will take them by twos and threes for a short drive, or an hour at his own pure hearthstone. Who will interest them in the labor they are bound to engage in, and who will show them that they are respected for what they achieve and will encourage the idea, that, to have belonged to a Reformatory means not disgrace, but removal from evil companionship.

It is curious to note in life, how strong an argument the dollars and cents column becomes, and the treatment of petty offenders by the moral method exhibits the record of financial success. We cannot afford to let the progeny of a miscreant cost us fifty thousand dollars—nay not fifty cents. The loss of material is fearful, for with judicious management such common sense practical reform as befits a well organized government transforms that which was formerly a burden into the resource of a state.

RELICS IN A CAVE.

Sometime since I visited a cave in the San Martin mountains, Los Angeles county, California, which contained some interesting Indian relics. It is in a wild, rugged and picturesque region, and the cave which is one thousand and four hundred feet above the sea level, situated on the south side of a steep mountain, is difficult of access. It is a natural grotto in a somewhat friable rock, composed largely of small petrified oyster shells, most likely of pliocene origin. The excavation is about twelve feet deep and sixteen feet long, and not sufficiently high for one to stand upright. The bottom was covered with sand caused by the disintegration of portions of the roof and surrounding walls.

In this cavern were deposited nine baskets manufactured from tule, and varrying in size from six to twenty inches in diameter. With the exception of the smallest basket, which was found inside of a larger one, each was covered with a neatly fitting cap woven from the same material, and each basket stood on a mat of the same. Three or four of the baskets were in a good state of preservation, while the others were askew, or had been gnawed by wood rats which are abundant in this section, and had constructed a large nest in the cave.

One of these baskets contained fourteen notched sticks an eighth of an inch thick, from one to two inches wide, and from ten to fourteen inches in length. These sticks have been painted, some crosswise and others lengthwise, with streaks of red and probably blue paint. It is most probable that they were used for chronological purposes, each notch indicating a moon or other specific period. Some of these sticks have as many as one hundred notches. They are made of red wood and are perforated at each end.

Another basket contained thirty-three head-dresses of birds feathers. The wing and tail feathers of a variety of birds have been used, but the flicker [*colaptes chrysoides*] predominates. They were made by lapping the quill ends and sewing them together after which the feathers were alternated until the desired length was obtained. These dresses are from five or six inches to nearly a foot in width and from two to five feet in length. Some are plain white, while others are more ornamental, being made of different colored feathers.

In another basket was found forty-five whistles, made from the tibiæ of the deer, abont ten inches in length. One end had been cut off and the bone dressed down forming a mouthpiece, after which the cellular portion of the bone had been removed and a lateral opening made about three-sixteenths of an inch in diameter opposite which asphaltum had been placed in such a manner as to cause the instrument to emit one or more sounds when the operator blew in the end. These bones had been wrapped with bark or some other pliable substance, and a mass of asphaltum fastened on the larger end into which was embedded a small piece of baliotis shell.

But still more interesting specimens were found in another basket. These consisted of four perforated stone discs or hammers containing handles. The discs are probably serpentine and measure from four to five and a half inches in diameter. The sides have been reamed, in the usual method of perforated discs, leaving the hole much smaller at the center. the handles are of *toyon* or bearberry which is amongst the hardest woods in southern California, and are from thirteen to seventeen inches in length. The handles are set a little slanting to the base, or flat side of the disc, and are fastened with an asphaltum cement. Two of the discs still retain paint markings. For what purpose they were intended is not quite clear to us. If for hammers they are the only ones of the kind of which we have heard in this country. The usual method of fastening the handle is by groove and withe, and not by drilling a hole through the implement. We are inclined to the opinion that these were used as implements of war, or were used in religious rites. But whatever may have been their use they are unique, as far as we know.

In excavating the bottom of the cave we found considerable basket work as though it had been covered with this material. A wedge was found, made of the base of a deer's antler, four and a half inches long by one and three-eighths inches in diameter, wrapped securely at the larger end with a kind of cord to prevent splitting when in use. Also a haliotis shell *Haliotis crasherodii*, having the holes filled with a cord, and used, probably, for a drinking cup. A shell ornament and portions of deer's antlers, and a serpentine implement for smoothing and straightening the tools for their basket work, were also found. The cave bears no evidences of having been used for a place of residence, but simply as a deposit for these specimens, most or all of which have doubtless been used in their dances and religious rites and ceremonies. How long these specimens have remained in the cave, it is difficult to determine. Being perfectly dry, and beyond the reach of rain or sunshine they would remain for a great length of time without decay.

STORAGE BATTERIES FOR MOTORS.

While one class of experimenters has been devising ingenious expedients to conduct currents of electricity to motors on moving cars, another has been no less indefatigable in seeking for ways and means to do away with the necessity for this by carrying the source of the electricity on the car. Both classes claim to have solved the problem. The last utterance in the *Electrical Review* comes from Baltimore and is a description of an experiment with a new storage battery. It is as follows:

BALTIMORE, July 17, 1885.

Editors of the Electrical Review:

A successful test and demonstration of the storage battery, as a motive power for city passenger railways, was made on the Union Railway, in this city, on Tuesday last. The Union Company have the Daft system in operation on the suburban branch of their road between Baltimore and Hampden—about two miles.

This road passes through one of the most hilly sections in Baltimore County. There is scarcely three hundred feet of level road the entire length. The heaviest grade on a tangent is 319 feet, and on a curve 352 feet per mile. The sharpest curve has a radius of but 50 feet, aud the largest 89 feet.

One of the Daft cars was used for the experiment, on the floor of which 49 one-quarter horse-power (four-plate) cells were placed.

This battery was connected to the motor by a three-way switch for connecting either 29, 39 or 49 cells, according to the power required.

These cells were part of a lot that had been made for lighting purposes, and not intended for the purpose for which they were used. The total weight of car, with battery, motor and 18 passengers, was about 10,000 lbs. At start 29 cells were used, indicating an E. M. F. of 42.63 volts and 61 amperes. The total resistance in circuit was .6943 ohms. The horse-power developed was 3.4.

In passing around curves and ascending the grades, 39 and 49 cells were necessary. In the latter case, the total resistance was .83 ohm; the E. M. F., 72.18 volts; and the current, 87 amperes, developing 8.5 horse-power.

The speed attained was eight miles per hour on the level, and from four to six on the curves and grades.

Several trips were made over the road, in order to discover, if possible, the weak points in the system. None were developed.

The plans for this experiment were devised by Mr. A. H. Bauer, the electrician of the Viaduct Manufacturing Company, who has within the past two years made the storage battery practicable.

The success of this demonstration proves conclusively that the use of storage battery for street car purposes is the only solution of the problem of substituting electricity for horses in cities.

It is now the intention to put the system into service on the principal railways in Baltimore.

For that purpose, large cars, capable of carrrying sixty passengers, will be equipped with battery, motor, etc.

Sufficient battery power will be furnished to develope ten horse-power on the shaft.

All the plans for the system have been thoroughly worked out by Mr. Bauer, the details of which will be made public as soon as the patents are issued.

Judging from the interest shown by the different street railway companies in the work done by Messrs. Daft and Bauer, it is believed to be a question of but a short time when, for the purpose under consideration, horses will be displaced by electricity.

C. D.

ELECTRIC RAILWAYS.

[A report read before a meeting of the stockholders of the Henry Electric Railway Co., July 14, 1885.]

Gentlemen:—At the suggestion of Col. Case, I make this report concerning the developement of the Electric Railway.

I will first briefly call your attention to the occasion and objects of our association.

In soliciting your subscriptions to the fund, I promised to demonstrate the feasibility of the system at an expenditure of $4,000, or less. This we have done, within three months from the date of my employment, and have a car running on the track. Since that time we have been vigorously at work experimenting with the view of reducing the system to the best practical basis.

In doing this, we have labored under great disadvantages.

In the first place, our car was not designed for such a purpose as that to which we have attempted to put it, and will not stand rigidly with the weight of the necessary machinery.

Secondly, the track on which we are operating is perhaps the poorest in the County; while the grades are more severe than upon 95 per cent of the roads in the country.

The work that we have had to do, although unpleasant, has constituted a severe test, and its accomplishment will be the best recommendation that our system can have.

My efforts have been directed to the end that we might take a loaded car up a six per cent grade, at the rate of eight miles per hour. I understand that a practical demonstration of this result will induce Mr. Holmes to adopt our system on his line. So far, we have not been successful, but have been gradually approaching this result. We can now take a loaded car up a five per cent grade at the rate of five miles per hour, which is equivalent to making, with two cars on a level track, a speed of ten miles per hour. We can purchase motors of four times the power of ours, and do four times the work, but I did not deem it necessary in my experiments to demonstrate the principles merely.

I can see chances to still increase the efficiency of our machinery, and expect better results shortly.

In this connection I will state that the machine we now have is a makeshift to demonstrate, in the easiest way, the principles involved; to learn, by practical experience, the forces and strains with which we have to contend.

We now need a car designed for the purpose, and new machinery constructed so as to stand any ordinary work on the track, and such as can be safely placed in a non expert's hands.

Concerning the inventions embraced in our schemes, I would say that the most valuable are those that are the most practical and useful and which cannot be circumvented by others.

The policy of an inventor is not only to make perfect machinery, but to protect by patents even inferior ideas which others might use.

We have copies of all the patents issued on the subject of Electric Locomotion, and find no principles that are not common property that we would care to use. Our first patent has been passed upon by the department at Washington, and twelve out of the fourteen claims which we make for new inventions have been allowed. The other two we do not need, but our attorneys are contending for them.

Our second patent has been applied for, and we are preparing the papers for a third.

While it is possible to run a motor fast or slow, it is a fact well known to electricians that to get the most efficient force from it, it should run at a certain, constant, steady rate of speed. To increase or decrease this is a direct loss of energy, or waste of fuel. My efforts have been to increase or decrease the speed of the car, without changing the movement or efficiency of the motor. Our patents cover the only two means I can conceive of for doing this. This opinion has been corroborated by a number of my expert mechanical friends.

Our mechanical movements are all new, and have never been used before in any connection. Our latest patent will cover some improvement in motors—means of changing same, so that when the car is forced down hill by gravity, the motor is changed to a generator, and induces a current of electricity which assists other cars up the grades.

Another feature is a system of underground conductors, which I regard as being far in advance of anything proposed, particularly for long lines. This has in view the utilization of condemned railroad rails, or cables for conductors. such as can be bought on this market for one cent per lb. Copper, according to weight, has double the conducting capacity of iron, but costs 17 1-2c. per lb.

The larger the conductors used, the less force we lose in transmission. The limit is only reached by figuring the interest on the cost of the conductors.

That electricity is the coming force for transmitting power, I am thoroughly satisfied, and this belief is strengthened by the published utterances of the best electricians of the country. Among them the men who laid the Cable, invented the Telegraph, Telephone and Electric light systems.

The reasons for this are many. First: The best locomotive made consumes seven lbs. of coal to the horse power developed per hour, whilst stationery engines are very common that do not use one-third of this amount. Second: Dummy engines that will accomplish what we are attempting, carry seventeen thousand lbs. dead weight, whilst we carry but forty-two hundred lbs.

Motors have but three wearing surfaces, while engines have a great many. By the use of motors the objectionable features of smoke and steam are avoided. The cost of equipping an electric road need not be over ten per cent greater than horse roads, and the cost for operating the same need not be one-third the expense.

In conclusion, I would urge upon you the necessity of providing for the completion of the work. JOHN C. HENRY, Electrician.

Before going to press, Mr. Henry handed in the following postscript:

"Since making the above report we have increased the efficiency fully thirty per cent. We have run the car fifteen miles per hour on the level, and eleven miles per hour up a four per cent grade."

AN ARIZONA NATURAL BRIDGE.

During a visit to Arizona, I came across a natural bridge, an account of which may be of interest in connection with recent notes on the Virginia bridge.

A long ridge, about six hundred or eight hundred feet high, extends for some distance north from a point near which the Atlantic and Pacific railroad crosses the boundary between New Mexico and Arizona. This ridge is formed by strata of dark-red sandstone under light-red, and is capped by a stratum of fine conglomerate or coarse grit. These strata are broken, and present an rbrupt and generally perpendicular face to the west, sloping at an agle of fourteen degrees to the east, with the course ofthe stream, until they bury themselves below the alluvial sand. There are lower ridges, of corresponding structure, parallel to this on the eart and west. This ridge is cut by deep and narrow canons. At the mouth of one of these canons, just before it dips under the sand, occurs this bridge. It is about twenty miles from the railroad, and, as far as I know, has never been visited by white men. I was guided to it by my Indian scout. The canon extends west for about five miles above the bridge, and becomes deep, narrow, and wild; the sides, with their growth of hard-wood and pine, almost cutting off the light at mid-day.

The bridge is formed by a remnant of the overlying grit, which is continuous with it on both sides. The section cut through beneath it is of light and dark red sandstone, the former showing very pretty cross bedding, and is non-conformable to the latter, which has much less dip. The bridge is sixty-five feet long, and fifteen feet wide at the narrowest point. It is two feet thick in the centre; and fifteen feet at the sides. The illustration, from a photograph taken at the time, will give a good idea of the position and proportions of the bridge; our ponies, standing underneath; serving for comparative measure. It will be seen that the canon is wider for a short distance above the bridge, which may be due to a tributary canon at that point.

It is difficult to give an explanation of this curious phenomenon; and I shall only suggest a possibility, in the hope that some one will find time to investigate it more thoroughly. If above the present grit there had been soft strata, capped again by grit, it might be explained on the principle of Swiss pot-holes; a waterfall being formed above, which wore a hole through the lower grit, and so undermined it, and cut out the sandstone beneath, as the at Trumelbach. But the grit has every appearance of being a continuous cap over the ridge. The grit shows, however, evidence of an inclination to break into blocks; and it may be that a large crack, thus formed to the west of the present bridge, allowed the stream to reach the soft sandstone, and so cut it away beneath.

A short distance off is another curious but not so uncommon phenomenon,—a 'petrified forest.' The stone tree-trunks lie just beneath the soil, or half exposed, fallen in all directions. I procured specimens which showed the bark, knots, roots and branches. The radiate arrangement of the wood-cells was very evident in some cases. There are a number of these 'petrified forests' in Arizona, I was told. I know only of one other on the Navajo reservation, and one near Flagstaff.—Science.

THE ROUND OF LIFE.

What I shall say on the above subject will not possess the merit of novelty to students of science, especially not to botanists, for the facts have been frequently given in better words than I can employ. But nearly all that has been heretofore written relative to the matter, is only to be found in scientific books or periodicals not conveniently accessible to the general reader; hence a few brief reflections on the subject cannot be amiss and may arouse interest concerning some of the by-ways that lead into the great thoroughfare of Life and Thought.

All terrestrial phenomena may be classed under two grand divisions: the organic and inorganic. To the first of these belong all manifestations of nature which show the presence of life, or vital force, and the capability of self-movement. To the second belong those manifestations which evidence the absence of life and self-movement. The organic world could not exist without antecedent life—that is each living individual, whether plant or animal, must have descended from a similar, prior individual; but the inorganic world is the result of chemical and mechanical processes and its combinations are fortuitous. The inorganic world is again divided into two Kingdoms, one of which has been called the Vegetable, the other the Animal, Kingdom. In the higher forms of life it is an easy matter to draw a line between them; but as we descend to the lower forms it becomes very difficult to distinguish between the two Kingdoms. This is especially the case with those forms which cannot be perceived by the unaided vision and which must be examined by the aid of a microscope. But though the distinction between these different phases of organic life, in their external relations, is sometimes difficult to make out, it is really definite and certain, and can be readily resolved if the habits and characteristics of the doubtful organism can be determined. The grand and most obvious distinction lies in the fact that all vegetables, except some families of parasitic plants, and, perhaps, some species described as carnivorous plants, feed alone on inorganic matter, while animals derive their sustenance from organized matter.

From this fact the inference seems inevitable that vegetable life must have preceded animal life, for without vegetable food all animal organisms would quickly and utterly perish. While animals and plants differ so widely in their mode of life, that is in the food they consume, as well as in their organization and locomotive powers, they yet approach each other very closely in several essential points, and in their genesis are really identical. Actual life, or vitality, is the same in both animals and vegetables; the only difference being the structure of the house it dwells in. All plants possess, in some measure, the power of self-movement. Even the most quiescent, move as absolutely as the sensitive plant, venus fly-trap, or the stamens of the barberry; though their motion is not so rapid, and consequently not so apparent to ordinary observation. Whole families of microscopic aquatic plants move from place to place freely, with a spontaneous motion equalling that of some of the lower order of animals.

Plants, like animals, have their hours of sleep and rest. In the higher order of plants the young are developed in ovaries contained in the seed. Provision is also made in the parent plant for the support of its off-spring, and in sufficient quantities to last until the young plant becomes vigorous enough to draw its own sustenance from the elements. It is indeed from this provision of vegetables for their off-spring that animals derive a large portion of their nourishment; without it many could not exist. This stored food is to be found in all kinds of seeds as well as in the roots and tubers of plants and their succulent stems.

But it is in actual life, or vital force, that all distinction between animals and plants are lost. In this respect the young lady and the rose that adorns her bosom are the same, and the like is true of the ox and the plant it feeds upon. In the simplest water plants of the sea-weed family the structure of the seed is at first a very minute rounded mass. When one of these globules escapes the mother plant it often swims about freely in the water in various directions with a truly spontaneous motion; and at this time it so closely resembles an animal organism that it is frequently mistaken for one. After enjoying this active life for several hours, it comes to rest, forms a covering of cellulose, and thereafter becomes a true vegetable cell, fixes itself to some support, germinates, and grows into the perfect plant. Each living plant cell carries on a circulation of its own. This may be seen in the transparent stems of Chara and many other water plants, and in the leaves of the Fresh-water Tape-grass. Here the fluid circulates in a steady stream, just beneath the wall, around each cell; passing up one side, across the end, down the other, and so round, to complete the circuit; carrying with it small particles, or the larger green grains, which make the current more visible. This circulation may also be seen in hairs of plants, particularly those of flowers,—such as the jointed hairs of Spiderwort, and the hairs of the nettle, looking like strings of beads, each bead being a cell. The substance which shows independent movement in the cells and hairs of plants and the little rounded mass of sea-weed is *protoplasm*. This constitutes life, or the physical basis of lite. It is present in the circulatory system of animals as well as plants, and is in every respect characterized in the same way in both. But these particles are so very minute that to see them distinctly requires a magnifying power of six or eight hundred diameters. Every plant proceeds from a single extremely minute vesicle, or cell. Growth takes place through this vesicle, or cell, dividing by the partition of a cross partition into two such cells, cohering together; one of these into two more; and these repeating the process by partitions made in both directions, forming a cluster, or mass of cells essentially like the first, and all proceeding from it. So the plant is an aggregation of countless millions of little vesicles, or cells, essentially like the cell it began with in the formation of the embryo; and this first cell is the foundation of the whole structure, or the ancestor of all the rest.

Now it is impossible, that this little vesicle, or cell, which is but a very small fraction of a grain in weight, and so little as to require great magnifying powers to be seen, could increase itself into a large tree containing innumerable millions of living cells equal to itself, the whole many tons in weight without the existence of vital force or actual life. To do this the little cell, and those proceeding from it, by some law unknown to us, have the power of converting inorganic, or dead matter into organic, or living matter, that is of feeding upon and assimilating inorganic substances. It is, therefore evident, that life is drawn from, and built up of non-life. We however, only know life as associating with, or following preceding life; yet, we do know that it is built up of the elements composing non-life, or inorganic things; that is, matter is taken up and from a state of death and inactivity is changed to a state of life and activity.

Plants are built up of carbon, hydrogen, and oxygen, with a small proportion of ammonia, and from two to ten per cent of other inorganic matter. We know the chemical composition of plants, but by bringing these elements together, we cannot produce life. As well might we expect a temple adorned with architectural beauty to spring into existence from throwing the raw material together, as to expect life to develope from bringing the elements together, that plants build themselves with. By some hidden law an almost infinitesimally small germ of life has the power of converting inactive matter into active living matter, to form plants. These, in turn, compose the food of animals, and are assimilated by them to form another complication of life, i. e., animal life. If the plant is burned, or suffers natural decay after death, it returns to its original elements and in precisely the same proportions as drawn from the earth and air, or, if the plant is devoured by an animal, precisely the same thing occurs at the death and decay of the animal. A little living germ, in some incomprehensible way, causes inactive matter to become active for a little season. It first manifests life and activity in the plant, then in the further complication of animal life, and at the death and decay of the plant or animal becomes dead matter again. Here is the whole round of physical life. It is drawn from dead matter, and, after a short interval of activity, returns to dead matter again. Is the germ, too, made active by some force inherent in matter? It sometimes remains inactive in the seed for many years, and then springs into life. But then it may be said to inhere in the seed, and so it is. We have no right however, to assume that conditions have never been such as to produce the germ itself from dead matter, or that such conditions do not now exist, or that they may not exist in the future.

ZOOLOGICAL ENIGMAS.

The largest land-serpent of which we have any trustworthy account is the *ular sawad*, or swamp-python, of 55 feet, which Sir Stamford Raffles saw on the west coast of Sumatra, but a much larger boa seems formerly to have inhabited the tropical and sub-tropical regions of the old world. Pliny states that a serpent killed in the Pontine Swamps during the reign of the Emperor Claudius had the entire body of a child in its belly, and Seutonius mentions a python of 50 cubits (75 feet) in length that was killed near Agrigentos (the modern Girgenti) and exhibited in front of the Comitium.

But the strangest classical snake story (with the exception of the Laocoon myth) comes from Numidia, in Northern Africa, where, according to Valerius Maximus, a whole Roman army was kept at bay on a ford of the Bagrada, by a monster sepent that killed fourteen men who had attacked it with their broadswords, but which was at last crushed by a well-aimed stone shot from a *ballista*, used in the siege of fortified towns.

The largest South American boas are only 30 feet long, but, according to the Brazilian naturalist, Becera, the Indian tribes of the Pocantins River believe firmly in the existence ot a *gusano cavador*, a monstrous subterranean serpent that tunnels its way through the mold and root-tangle of the primeval forest; living on burrowing rodents and armadillos, and such larger animals as happen to approach the entrance of its den. Becera states that he went to see one of these dens fourteen miles west of the Mission of San Rafael, and found a spacious burrow opening on the bank of a brook under the roots of an overhanging Adansonia tree, and lined with a peculiar viscid substance as if a slimy reptile had forced its way through the opening. The tunnel measured about four feet in diameter, but seemed to get narrow further down. For sixty varas (about as many yards) from the tree ruptures and upheavals of the soil could be traced along the surface of the ground; but as such ruptures are sometimes caused by the fall of a large tree and the consequent strain on the roots, Becera did not quite know what to make of the matter. The accounts of the Indians, though strangely unanimous on some points, are in other respects evidently preposterously absurd, for a chief of the Guinibas assured the naturalist that the gusano was a hairy serpent, and had short, sharp teeth, like an ocelot (sort of catamount, but was too timid to use them for homicidal purposes.

The egg-shaped cirripeds (*Balanus Marinus*) were probably the prototypes of the "barnacle-goose" eggs mentioned in the natural histories of the Middle Ages, and seals of the mermaids; but where did our forefathers see the originals of their unicorn emblems? Was it in Java, where fanciful representations ot the one-horned rhinoceros figures here and there in old temple-sculptures; or was it in Southern Africa, where the gnu with its equine hoofs, tail and mane might pretty well pass for a horned horse, especially from a distance? And it may be doubted if, before the invention of gunpowder, the shyest of all African antelopes had ever been closely examined.

The harpy myth probably originated in Southern Asia. In Siam, Malacca and the Sunda Islands there are bats that attain the size of a squirrel (flying-foxes the English settlers call them), and, being exclusively frugivorous, are a worse pest than the English sparrows in cherry time; for their alimentary needs are out of all proportion to their size, and the kalong or Cingalese flying-fox can eat his own weight in half a day. Like caterpillars, they seem to digest about as fast as they can swallow. Donald Burns, a pet-dealer of Roosevelt street, New York, imported last year some twenty or thirty pair of these eupeptic night-birds; but, finding the demand rather limited, shipped them off to all the Zoos in the country, rather than be bothered with the exigencies of their monstrous appetite. Half an hour after devouring eighteen ounces of stewed vegetables apiece, they would commence their clamor for lunch, clambering up to the brink of their straw boxes and shrieking away with quivering wings. They gulped their food like crocodiles, and after exhausting their appropriation would swing their heads to and fro with fretful squeaks, and now and then vent their spleen by attacking their next neighbors, who would never defend themselves until they had gobbled up their rations to the last crumb.

It may be imagined what damage a flock of such gluttons can do in a banana garden. In Batavia, trees have to be protected by nets to save a single fruit, and if currants, etc., are dried in the open air, they have to be secured every evening, for a few minutes after sunset the winged imps begin to swarm, and are greedy enough to snatch their favorite vegetables from under the very eyes of the cultivator. If driven back, they will cling to the next tree, fluttering and screeching, and, if thoroughly scared, ease themselves after the manner of frightened monkeys. All these things the ancients used to relate about the harpies—winged demons whom the gods sent in their wrath for the affliction of obnoxious mortals, whose food they would snatch out of their hands and defile what they could not devour.

The belief in vampires is less explicable. Few persons may be aware that in the Danubian principalities the belief in the ghoulish practices of mysterious night-walkers, is still as prevalent as the night-air superstition in the United States. Ninety per cent. of our fellow-citizens honestly believe that they cannot open a bedroom window after dark, without admitting affliction in the form of a lung diseasing draught; and nine out of ten Bulgarian housewives never retire for the night without placing a crucifix near the threshold, as a precaution against the visits of the Vrokalaka. The bodies of sleepers who had neglected that precaution were found almost *exsanguis* —as nearly bloodless as if they had passed a night in a Florida cypress swamp, and with the marks of the vampire's teeth still visible on their necks and arms. If the sleeper awakened in time the ghostly visitor would disappear like a shadow, not apt to retürn for a while, though persons who had once undergone the horrid operation were ever afterward subject to strange fainting fits that aided the ghoul in the accomplishment of his hellish designs. Whole archives full of testimony on the subject have been collected by German and Hungarian publicists; and the most singular theories have been advanced to explain the origin of the strange belief.

Prof. Raupt's explanations are mostly mythological, but a recent Hungarian writer, Maurus Tokar, seems to incline to the opinion that the vampire superstition has a zoological basis, viz., the existence of nocturnal *Miudes*, allied to the Cingalese land leeches, and gifted with the caution of the South American vampire-bat. In support of this hypothesis the Hungarian naturalist quotes the testimony of many Servian and Roumanian physicians, and one very curious story from southern Russia.

A few miles east of the City of Berislav, near Odessa, there is an estate of pastures and forest lands almost surrounded by two affluents of the Dnieper, and containing an old fuedal mansion which for generations has been the favorite country seat of the Counts Lermonhoff, all famous for their hospitality and passion for field sports. In the winter of 1826, one of these Muscovite Nimrods had his house full of friends, and one of his guests had to be quartered in a turret-room, which, on account of its defective ceiling and consequent liability to dampness, had not been used for years. In the twilight of the next morning the guests assembled for breakfast, as they wanted to get an early start for the hills; but their host noticed that one of the chairs remained vacant. After waiting for a quarter of an hour or so the Count compared notes with his major-domo and ascertained that the missing guest was the gentleman quartered in the turret,room.

They knocked at the room and waited and knocked again, but finally opened the door by force. Their guest was dead. Twelve hours ago he had been full of fun and merriment; but there could be no doubt of it, he had died during the night, and probably before midnight, for his body had already turned rigid. "A stroke of apoplexy" was the verdict of the survivors, who after a day or two resumed their programme of amusements. But eight months after an exactly similar episode set the whole neighborhood agog. During the absence of the proprietor, some officers of a cavalry regiment temporarily stationed in the village, were introduced by an old friend of the family, and, being caught in a rain storm, were obliged to accept the hospitality of the ladies, who, in stress of circumstances, quartered a tipsy old Major in the turret-room. The next morning the old man was found dead in his bed. The surprise of his comrades was far surpassed by the consternation of the ladies, who, however, for the time being, were glad to accept the explanation of his brother officers, that the father of the deceased had died in a similar way, and that it might be in the family, with covert hints at the bibulous propensities of the old trooper. But a day after the Count returned the "turret-chamber" was subjected to rigorous examination. Every piece of furniture was removed and cleaned, the defective tapestry was scraped off and replaced by a coat of whitewash; the door and the window sashes were pried apart and tightened, and every cranny of the room was carefully scrutinized; but the turret-room refused to yield up its mystery.

It was remembered that one of the fatal nights had been by no means, unusually damp; that the dampness of the room was, in fact, not worse than that of many other apartments of the old house; and the Count, dissatisfied with the result of the investigation, gave positive orders that the room should never again be used for a guest chamber.

That was the summer of 1824. A few days before the Christmas feast of that year, the Count's son, an adventurous and light-hearted young student, returned from college, and though the village gossips had already acquainted him with all the current details of the turret story, he was evidently much impressed with his mother's account of the mysterious affair. All the next day he cross-examined witnesses, and, contrary to his wont, seemed rather taciturn that evening, and, pleading fatigue, retired soon after supper. He had to keep a rendezvous. Half an hour after he had retired to his room there was a tap at the door, and the old major-domo slipped in on tiptoe. Plied with wine and money, the old man became communicative, and after a whispered consultation, the two conspirators packed a lunch-basket with sweetmeats and bottles, loaded a brace of pistols and started for the turret-room. Nobody had heard their movements, but about an hour after midnight, the whole house was startled by a series of piercing shrieks. Door after door opened, bewildered servants ran to and fro, till at last Count Lermonhoff flew up stairs and rushed into the turret-room. His worst suspicions were confirmed. On a pallet, in a corner of the hateful chamber, lay his eldest son—a corpse. The old steward, almost crazy with fear and horror, had at last recovered his speech, and volunteered a full confession. At the urgent request of his young master he had unlocked the mysterious room, lighted a good chimney fire, and procured an assortment of books and other articles, to pass the night as cheerfully as possible. Their plan was to watch by turns, and at 11 o'clock the old man had tucked himself up for a short nap, and, as he thought, had hardly been asleep for more than half an hour, when he was waked by a scream that made his blood freeze. What had happened he was unable to say; all he remembered was that in his last agony the unfortunate man had thrown his head to and fro, and pressed both his hands over his temple, where they remained even now, firmly interlocked and rigid in death.

When they at last succeeded in unclasping his hands they found under his fingers, with its sting embedded in the seams of its victim's skull, an unknown animal, which can now be seen in a vial of spirits of camphor, in the Museum of Odessa. In shape the nondescript appears like a cross between a leech and a lizard, but its tail, like that of a scorpion, terminates in a sharp point, and its skin seems to have been more wrinkled than that of the two animals which it most nearly resembles, though that may be due to the action of the antiseptic fluid. Where it came from—if it had lurked in the fissures of the ceiling or entered by some secret aperture—has never been explained; but no soul in Berislav doubts its instrumentality in the death of the last three occupants of the turret-room.—*Enquirer.*

THE QUEST FOR THE PRIMEVAL EDEN. *

A serious effort to prove that the Eden of the human race was situated at the North Pole may well provoke a smile of incredulity. Dr. Warren writes with the spirit of earnest conviction; "of the correctness of his position he has no doubt, and of the preparedness of the scientific world to accept it he is also confident." Such faith will remove mountains, and in this instance there are extraordinarily great mountains to be removed.

The quest for the primeval Eden has always had a fascination for speculative theologians and adventuresome explorers. It is a proof of the sway of natural and historical science, that the solution of this question should now be undertaken more in the interest of ethnology, archæology, and biology, than of theology. In reading this book one is struck with the meagreness of the attention devoted to what may be called the Biblical aspect of the question; the author is more concerned about Greek cosmogony than about Genesis. How to explain the topography of the Garden of Eden, with its "quadrifurcate river," may be of subordinate interest when compared with the question of the distribution of the human family from one supposed centre of origin.

Starting from the nebular hypothesis, Dr. Warren arrives at the conclusion that "while Paradise may have been anywhere, the *first* portions of the earth's surface sufficiently cool to present the conditions of Eden life were assuredly at the Poles." Then, without stopping to debate "the antiquity of man," he assumes that man was placed upon the earth just as soon as any part of it was habitable; and the conclusion must follow as a matter of course. Space will not permit us to follow in detail the author's application of the eight-fold scientific test to his theory. A few strictures must suffice. We fail to see how the glories of the polar day and night shed any light upon the problem. The argument from physiographical geology hardly takes any account of the influence of the glacial period upon the condition of the earth's surface at the time of man's advent. The "eradiation" of the flora and fauna of torrid and temperate zones from polar regions rests on insufficient evidence.

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* Paradise Found. The Cradle of the Human Race at the North Pole. A Study of the Prehistoric World. By William F. Warren. Boston: Houghton, Mifflin & Co.

The author next tries to find confirmation for his theory in ethnic traditions. It is in this part of his work that Dr. Warren especially shows the breadth of his reading, and brings to view some remarkable coincidences. The chapter on Ancient Cosmology and Mythical Geography is of especial interest. The opinion of Dr. Samuel Beal is made to do good service: "I have no doubt that the idea of a central mountain, and of the rivers flowing from it and the abode of the gods upon its summit, is a primitive myth derived from the earliest traditions of our race." This mountain of the gods, the theme of Hindu mythology, becomes the central figure in the theory of a Polar Eden, and is accompanied by "the tree of life" and "the four rivers" in Hindu, Chinese, and Iranian tradition. In these myths, the expressions "Centre of the Earth," "End of the Earth," "Axis of the Earth," "Omphalos," are made to mean the Arctic Pole. Greek students will be amused at the etymology of "the sacred expression" *meropes* as "the men sprung from Meru," even if Renan did discover it. How many Biblical scholars will accept the interpretation of *Kedem*, Gen. ii, 8, as meaning "front country," and make "front" stand for "north"? In the treatment of these traditions and legends, has not the author neglected his own caution, not to forget that in interpreting the cosmological and geographical references of ancient religious writings we have to do with ideas that are often expressed in a poetical and symbolical form? In weighing the writer's argument, we are tempted to quote against him his own citation from Hudibras:

> "He knew the seat of Paradise,
> Could tell in what degree it lies;
> And, as he was disposed, could prove it
> Below the moon or else above it."

Dr. Warren is of necessity a special pleader, and, like all special pleaders, he falls a victim to his own ingenuity. As an illustration may be cited his interpretation of *polyptychos* as applied to Mount Olympus, in the sense of "*many layers or thicknesses.*" This epithet, he goes on to say, "pictures that world-old conception of a firmament not single-storied, but with a heaven above heaven, to the 'third,' or the 'seventh,' or the 'ninth.' These heavens were conceived of by Homer himself as in layers one above another, like the curved *laminæ* of a shield. And what adds to the fitness of the comparison and to the fitness of the cosmic adornment of Achilles' shield, is the fact that to the *omphalos* of a shield there corresponded the central and ever-abiding *Omphalos* of the skies." But what says our author of the application of this same term to Mount Ida and to the ridges of Phocis?

Among the most readable chapters of the book are those entitled "The Origin and Earliest Form of Religion," The Philosophy of History," and "The Theory of the Development of Civilization." But the connection between these questions and the location of the Eden of the race at the North Pole is a slender one; an Equatorial or an Antarctic Pole would do, about equally as well or as ill in the solution of these problems. The wonder is not that Dr. Warren has failed to convince his readers, but that what at first glance seems a wild fancy should be made to seem worthy of serious consideration. Nor can anyone deny the laborious research and heroic devotion with which the author has pursued his enquiry.

The book is written in an attractive style. Possibly a less lavish use of such complimentary epithets as "distinguished," "eminent," "admirable," in referring to various authorities, would befit a work that aims to be a quasi-scientific treatise.—*The Dial.*

ASPECTS OF THE PLANETS FOR AUGUST.

VENUS

is evening star, and takes the first rank on the planetary annals of August, for two reasons. She has entered upon her period of visibility, and she figures as chief actor in the incidents that diversify the month. She will be the most interesting star in the heavens, from the present time until the end of the year, the distance between the queen of the stars and the sun increasing all the time as she moves on her eastward course until the 8th of December, when, reaching her eastern elongation, she commences to retrace her steps toward the sun. Therefore, one of the most charming pages of planetary lore, written in characters of gold, on the blue vault that encircles the earth, is unfolded on moonless nights for the observation of the student of the stars.

Unfortunately, our sister planet does not take on the most favorable aspect, on account of her increasing southern declination. It is well known that the farther south the sun is, the shorter is the path he describes in the heavens, and, consequently, the shorter the day. For the same reason when Venus is far to the south of the equator, her path in the heavens follows the same law, and her stay above the horizon is correspondingly lessened. The result is that though the distance between Venus and the sun is constantly increasing, she sets only about an hour after the sun, through August, September, and the first part of October. On the 1st of November, she sets two hours after the sun, and on the 1st of December she shines with bewitching grace for three hours after the disappearance of the sun. As, however, the twilight shortens with the shortening days, and her brilliancy and size increase with her approach to the earth, she will be more easily visible and far more beautiful as the autumnal months fulfill their course.

There is only a difference of ten minutes on the 1st of the month in the time of setting of Venus and Jupiter. On the 6th the former overtakes the latter, the conjunction taking place at 2 o'clock in the morning, Venus being 26 minutes south. The planets will be below the horizon when at their nearest point, but they will be near enough together on the evenings of the 5th and 6th, to form a lovely picture in the glowing twilight. On the evening of the 6th the planets will have changed places, Venus being on the east.

On the 8th, at 10 o'clock in the evening, Venus is in conjunction with Mercury, being at the time 3 degrees, 42 minutes north. It will be remembered that, on the 17th of July, the same planets were in conjunction. They were then both moving eastward, and Mercury, the swift-footed, overtook and passed his fair rival in the race. He has since reached his eastern limit, and, retracing his steps, again meets and passes Venus as he draws nearer to the sun. Hence the two conjunctions with so short a space of time.

On the 24th, Venus, still traveling eastward, encounters a third planet. Uranus is the fellow actor in the scene. They meet at 9 o'clock in the morning, Venus being 13 minutes north. The fair evening star then proceeds unmolested in her course without meeting a brother planet for the rest of the year.

Venus, not contented with paying her respects to Jupiter, Mercury, and Uranus, draws near on the 19th to Beta Virginius, a star of the 3d magnitude in Virgo, the planet being at the time 24 minutes north.

The right ascension of Venus on the 1st is 10 h. 24 m.; her declination is 11 degrees 35 minutes north; her diameter is 11.6 seconds; and she is in the constellation Leo.

Venus sets on the 1st a few minutes after 8 o'clock in the evening; on the 31st she sets at half past 7 o'clock.

JUPITER

is evening star. We award to him the second rank, as this is the last month he will hold the place of evening star during the present year. Before the month closes, his bright presence will be missed among the starry throng, for he will be eclipsed in the sun's rays. He must therefore be left to pursue his invisible course, while his belts, spots, and clouds will be hidden from terrestrial telescopes. He does not bid good-by to the earthly domain without mingling in the events of the month.

On the 4th, at 4 o'clock in the afternoon, he is in conjunction with Mercury, two degrees and thirty-two minutes north. Bright eyed observers may be fortunate enough to pick up the largest and the smallest of the planets in near vicinity, for Mercury should be visible about this time to the naked eye, and Venus follows closely on the track of both. The conjunction of Jupiter and Venus on the 6th, has already been described.

On the 27th, at 6 o'clock in the morning, Jupiter is in conjunction with Mercury for the second time in the month, being six degrees and one minute north. The explanation is the same as in the case of Venus. For Mercury having arrived at his eastern goal, on retracing his steps, overtakes the more stately and slower moving planet.

The right ascension of Jupiter on the 1st is ten hours and forty-one minutes; his declination is nine degrees and twenty-five minutes north; his diameter is thirty seconds, and he is in the constellation Leo.

Jupiter sets on the 1st, about a quarter after 8 o'clock in the evening; on the 31st, he sets about half past 6 o'clock.

MERCURY

is evening star, and is a near neighbor to Venus and Jupiter during the month, making one conjunction with the former, and two conjunctions with the latter planet, as has been stated.

On the 7th, at 3 o'clock in the morning, he reaches his greatest eastern elongation, being twenty-seven degrees and twenty-three minutes east of the sun. He is then so situated as to be visible to the naked eye, although not under the most favorable conditions. He is indeed at his maximum distance from the sun, but like Venus, is moving too rapidly southward to present his best aspect. Southern observers will enjoy a fine view of the fiery little planet at the time of his elongation. Observers who succeed in finding Venus and Jupiter, will find Mercury on the evening of the 6th, a little east, and about three degrees south of the larger planets. They all set not far from 8 o'clock.

The right ascension of Mercury on the 1st, is ten hours and thirty-one minutes, his declination is eight degrees and twenty-three minutes north; his diameter is seven seconds, and he is in the constellation Leo.

Mercury sets on the 1st, a few minutes after 8 o'clock in the evening; on the 31st, he sets soon after 6 o'clock.

URANUS

is evening star. Venus overtakes and passes him on the 24th, as he travels westward, approaching conjunction with the sun.

The right ascension of Uranus on the 1st, is twelve hours and one minute; his declination is no degrees and thirty-five minutes north; his diameter is three and four-tenths seconds; and he is in the constellation Virgo.

Uranus sets on the 1st, about 9 o'clock in the evening; on the 31st, he sets soon after 7 o'clock.

SATURN

is morning star, and is by far the most interesting of the three planets that precede the sun. He rises on the 1st, about 2 o'clock, and at the close of the month makes his appearance soon after midnight, and is a lovely object to reward the gaze of the observer in the small hours in the morning. The mysterious rings are now open to their widest extent, the planet is drawing near perihelion, and is also approaching the earth. By the last of September Saturn will be above the horizon at half past ten o'clock, and will not only be delightful to behold with the naked eye, but will afford a rare opportunity for telescopic research.

On the 5th, at 3 o'clock in the afternoon, Saturn is in close conjunction with Mu Geminorum, a star of the third magnitude in Gemini, passing four minutes south.

On the 6th, at 3 o'clock in the afternoon, he overtakes Mars. The planets are in conjunction. Saturn being one degree and twenty minutes south.

The right ascension of Saturn on the 1st, is six hours and fourteen minutes; his declination is twenty-two degrees and thirty minutes north; his diameter is sixteen seconds; and he is in the constellation Gemini.

Saturn rises on the 1st, ten minutes before 2 o'clock in the morning; on the 31st, he rises a few minutes after midnight.

MARS

is morning star. Besides being in conjunction with Saturn on the 6th, he also is in conjunction with Mu Geminorum, being at the time one degree and sixteen minutes north. Thus, Mars, the star, and Saturn are almost in line, the star almost touching Saturn. The double conjunction is invisible as it occurs at 3 o'clock in the afternoon, but though the actors in the scene will have changed places on the morning of the 7th, they will still be near enough to make an interesting celestial picture, that will amply repay an early riser for making the required effort. A small telescope or opera glass will aid the observer, who will find the planets in favorable position at 3 o'clock in the eastern sky.

The right ascension of Mars on the 1st, is six hours and one minute; his declination is twenty-three degrees and forty-nine minutes north; his diameter is four and eight-tenths seconds; and he is in the constellation Gemini.

Mars rises on the 1st, about half past 1 o'clock in the morning; on the 31st, he rises about 1 o'clock.

NEPTUNE

is morning star. On the 18th, at 4 o'clock in the morning, he reaches quadrature with the sun on his western side, and henceforth he is nearer to the earth than he is to the sun, that is, he appears to be.

The month closes with Neptune, Saturn, and Mars on the western side of the sun as morning stars, and with Mercury, Jupiter, and Uranus, and Venus on his eastern side as evening stars.

The right ascension of Neptune on the 1st is 3 h. 34 m.; his declination is 17 degrees 27 minutes north; his diameter is 2.5; and he is in the constellation Taurus.

Neptune sets on the 1st at half past 11 o'clock in the evening; on the 31st he sets at half past 9 o'clock.

THE MOON.

The August moon fulls on the 25th, at 25 minutes after midnight. The moon is in conjunction with Neptune on the 4th at 3 h. 49 m. P. M.; being at the time 2 degrees 45 minutes south. On the 7th, at 9 h. 5 m. A. M., she is in conjunction with Saturn, being 4 degrees 13 minutes south. Also on the 7th, 43 minutes later at 9 h. 48 m. A. M., she is in conjunction with Mars, being 5 degrees 33 minutes south. The conjunction is invisible, but the waning moon will be near the two planets on the morning of the 7th. On the 11th, at 9 h. 2 m. P. M., the new moon of the 10th is in conjunction with Jupiter, being 2 degrees 31 minutes south. On the 12th, at 3 h. 36 m. A. M., the moon is in conjunction with Mercury, being 1 degree 55 minutes north. On the same day, the 12th, but nearly four hours later at 7 h. 12 m. A. M., she is in conjunction with Venus, being 2 degrees 13 minutes south. The crescent moon and evening star, though not near each other, will be fair to see on the evening of the 12th. On the 13th, at 5 h. 49 m. A. M., the moon is in close conjunction with Uranus, being 17 minutes north. On the 31st, our satellite again commences her round. She is in conjunction with Neptune for the second time during the month at 10 h. 6 m. P. M., being 2 degrees 52 minutes south.

AUGUST

presents a full chapter of planetary incidents. There is an unusual stir among the members of the sun's family of worlds. The fairest of the stars pays her respects to her august brother Jupiter, to the swift-footed Mercury, and to the slow moving Uranus, while she fills out her portion of planetary work by a close conjunction with Beta Virginius. The prince of planets pays his court twice to the smallest of his brethren, who at least can outrun him in the race if he can do nothing else. The ring-girdled planet and the god of war meet and change places on the celestial road, and both planets pay their respects to the small star, Mu Geminorum, at nearly the same time, the approach in Saturn's case being an appulse, for 4 minutes of arc is in celestial mathematics a small space to intervene between two visible heavenly bodies. As the month passes, the light of Jupiter grows dim and fades away, Venus slowly advances to easy visibility and will soon put on her queenly apparel, Saturn is superb with his wide open rings and the beaming light hê borrows from a nearer approach to the sun, while the day of Martian importance nears the dawn.

METEOROLOGICAL NOTES FOR JULY.

[LOCUS, KANSAS CITY.]

Date	Max.	Min	8 A. M.		12 M.		3 P. M.		7 P. M.		Rainfall.
July			Ther.	Bar.	Ther.	Bar.	Ther.	Bar.	Ther.	Bar.	
2	70	57	67	30.11	68	30.11	68	30.06	68	30.06	0.30 inch
3	80	61	69	30.11	78	30.09	79	30.10	77	30.06	
6	82	59	69	30.01	77	30.06	79	30.06	78	30.06	1.17 inch
7	89	62	76	30.04	85	30.06	87	30.04	85	30.04	
8	92	73	80	30.04	88	30.04	89	30.04	80	30.03	
9	92	71	81	30.12	90	30.13	89	30.11	83	30.11	
10	75	67	75	30.19	72	30.19	68	30.16	71	30.10	1.09 inch
11	81	66	73	30.16	81	30.15	79	30.11	77	30.09	
13	93	65	79	30.07	90	30.08	90	30.06	87	30.09	
14	92	66	79	39.04	90	29.96	91	29.90	66	29.95	
15	92	64	79	29.96	90	29.95	92	29.90	87	29.87	
16	96	65	83	29.89	93	29.91	94	29.84	89	29.94	
17	77	65	71	30.23	72	30.27	77	30.24	73	30.24	1.23 inch
18	93	67	76	30.20	89	30.17	99	30.10	88	30.08	
20	94	71	81	30.04	91	30.04	92	29.99	89	29.97	
21	96	73	81	30.07	92	30.07	93	30.04	89	30.02	
22	94	72	81	30.04	92	30.02	88	29.99	76	29.97	0.08 inch
23	94	72	79	30.06	89	30.07	93	30.01	89	29.96	
24	93	73	81	30.06	91	30.06	92	30.01	87	29.99	
25	89	70	73	30.02	85	30.03	88	29.99	86	29.97	0.52 inch
27	93	68	79	30.16	90	30.19	92	30.19	80	30.15	1.40 inch
28	95	72	83	30.17	92	30.17	93	30.12	89	30.09	
29	96	75	85	30.17	93	30.17	94	30.06	91	30.04	
30	95	74	85	30.09	94	30.08	94	30.04	91	30.01	
31	87	69	75	30.08	85	30.02	87	30.06	84	30.03	0.19 inch

WAR DEPARTMENT, SIGNAL SERVICE, U. S. ARMY.

Division of Telegrams and Reports for the Benefit of Commerce and Agriculture. Meteorological Summary, for the month of July, 1885. Station, Leavenworth, Kansas.

DATE. 1885.	BAROMETER. DAILY MEAN	TEMPERATURE. DAILY MEAN.	TEMPERATURE. MAXIMUM	TEMPERATURE. MINIMUM.	DAILY Rainfall. INCH
JULY.					
1	30.050	65.2	71.0	60.2	.04
2	29.971	65.3	71.0	59.0	.08
3	29.968	69.5	78.0	62.4	......
4	29.873	73.7	87.0	62.5	.43
5	29.766	67.7	74.0	63.5	.83
6	29.899	71.0	85.0	60.0	......
7	29.887	78.7	91.0	67.0	......
8	29.893	82.0	92.5	72.0	......
9	30.001	79.0	88.0	74.0	......
10	30.047	68.3	76.0	65.0	.39
11	29.994	73.0	80.5	65.0	......
12	29.925	76.7	88.5	65.0	......
13	29.929	79.0	92.0	70.0	......
14	29.829	78.7	93.4	67.0	.22
15	29.764	83.0	93.0	72.0	......
16	28.831	83.7	97.5	74.0	......
17	30.110	71.5	81.0	65.0	.04
18	30.000	82.7	94.5	70.0	......
19	29.907	84.0	97.0	72.0	......
20	29.865	83.0	94.0	73.2	......
21	29.913	82.8	94.5	72.0	......
22	29.876	81.3	94.5	73.0	......
23	29.888	84.5	97.0	74.7	......
24	29.906	80.2	90.5	72.0	.09
25	29.882	78.7	88.0	72.0	1.00
26	29.969	78.7	90.5	68.0	.85
27	30.019	79.5	92.5	69.5	.17
28	29.997	84.0	98.0	73.0	......
29	29.939	85.7	97.0	76.0	......
30	29.930	85.7	96.0	75.5	......
31	29.913	79.0	88.0	68.4	.42
SUMS	927.740	2415.8	275.4	213.2	4.56
MEA'S.	29.927	77.9	88.8	68.8	......

GENERAL ITEMS.

Highest Barometer 30.132; date 17th.
Lowest Barometer 29.701; date 16th.
Monthly Range of Barometer .431.
Highest Temperature 98 degrees; date 28th.
Lowest Temperature 59 degrees; date 2d.
Greatest Daily Range of Temperature 26.4 degrees on the 14th.
Least Daily Range of Temperature 11 degrees on the 10th.
Mean Daily Range of Temperature 20.0 degrees.
Mean Daily Dew-point 68.9.
Mean Daily Relative Humidity 75.5.
Prevailing Direction of Wind, South.
Total Movement of Wind, 4,315 Miles.
Highest Velocity of Wind and Direction 26 Miles Northwest, on the 4th.
Number of Foggy Days, None.
Number of Clear Days, 12.
Number of Fair Days, 15.
Number of Cloudy Days, 4.
Number of Days on which Rain or Snow fell, 12.
Depth of unmelted Snow on ground at end of month, None.
Dates of Auroras, None.
Dates of Solar Halos, None.
Dates of Lunar Halos, None.
Dates of Frosts, None.

COMPARATIVE MEAN TEMPERATURE.

1871	77.6	1878	80.3
1872	78.4	1879	79.8
1873	77.5	1880	78.2
1874	82.8	1881	80.2
1875	77.6	1882	72.5
1876	78.9	1883	76.8
1877	76.3	1884	77.3

COMPARATIVE PRECIPITATIONS.

1871	5.20 inches	1878	3.08 inches
1872	9.99 "	1879	4.99 "
1873	2.04 "	1880	6.86 "
1874	3.23 "	1881	1.72 "
1875	8.82 "	1882	3.44 "
1876	4.01 "	1883	3.58 "
1877	5.34 "	1884	9.43 "

CHAS. DIEL,
Sergeant, Signal Corps, U. S. A.

WEATHER REPORT FOR JULY, 1885.

Prepared by Professor F. H. Snow, of the University of Kansas, from Observations Taken at Lawrence.

The first twelve days of this month were, with one exception, remarkably cool for the season. This brought the average temperature for the entire month below the July mean, although sixteen of the last nineteen days were oppressively hot. The rainfall was above the average and was unusually well distributed.

Mean Temperature—77.06 degrees, which is 1.16 deg. below the July average. The highest temperature was 96 deg. on the 16th; the lowest was 56 deg. on the 2d, giving a range of 40 deg. The mercury reached 90 deg. 17 times. Mean temperature at 7 a. m., 73.20 deg.; at 2 p. m., 85.64 deg.; at 9 p. m., 74.71 deg.

Rainfall—6.03 inches, which is 1.53 inches above the July average. Rain fell on 13 days. There were 5 thunder showers. The entire rainfall for the 7 months of 1885 now completed has been 21.84 inches, which is 0.26 inch above the average for the same months in the preceeding 17 years.

Mean Cloudiness—43.76 per cent. of the sky the month being 5.79 per cent. cloudier than usual. Number of clear days (less than one-third cloudy) 15; half-clear (from one to two-thirds cloudy) 9; cloudy (more than two-thirds) 7. There were three entirely clear days and four entirely cloudy. Mean cloudiness at 7 a. m., 50.97 per cent.; at 2 p. m., 42.90 per cent., at 9 p. m., 37.42 per cent.

Wind—S. W., 40 times; N. E., 16 times; S. E., 13 times; S., 9 times; N. W., 9 times; E., 4 times; W., twice. The total run of the wind was 8,422 miles, which is 400 miles below the July average. This gives a mean daily velocity of 271.68 miles and a mean hourly velocity of 11.32 miles. The highest velocity was 40 miles an hour on the 8th and 16th.

Barometer—Mean for the month; 29.065 inches; at 7 a. m., 29.072 inches; at 2 p. m., 29.045 inches; at 9 p. m., 29.077 inches; maximum, 29.265 inches, on the 17th; minimum, 28.833 inches, on the 15th; monthly range, 0.432 inch.

Relative Humidity—Mean for the month, 72.9; at 7 a. m., 81; at 2 p. m., 59.8; at 9 p. m., 77.9; greatest, 97, on 24th; least, 40, on 21st. There was no fog.

The following table furnishes a comparison with the 17 preceding Julys:

July.	Mean Temperature	Max. Temperature	Min. Temperature	Hot Days.	Rainy Days.	Rain—inches	Thunder Storms.	Mean Cloudiness.	Humidity.	Number of Fogs.	Miles of Wind.	Mean Barometer.	Max. Barometer.	Min. Barometer.
1868	85.90	101.0	70.0	26	4	4.05	4	45.96	..	0	......	... ..	......	......
1869	75.22	93.0	47.0	6	11	5.05	7	53.33	84.5	2	......	29.073	29.284	28.777
1870	80.27	99.0	55.0	22	12	5.58	4	30.64	64.2	2	......	29.058	29.252	28.813
1871	80.28	103.0	60.0	17	13	7.30	6	49.79	....	0	......	......	......	......
1872	77.96	93.5	61.5	11	13	6.50	9	50.86	75.2	2	9,203	29.061	29.283	28.772
1873	77.90	97.0	62.5	12	6	2.38	2	30.54	64.3	1	9,952	29.083	29.353	28.699
1874	83.62	103.0	68.0	21	5	1.19	4	26.88	52.1	0	10,904	29.079	29.256	28.765
1875	76.63	97.5	65.0	8	13	6.60	5	54.30	73.0	0	8,458	29.070	29.383	28.877
1876	78.60	95.0	60.0	12	6	3.51	3	30.48	72.7	0	8,901	29.075	29.268	28.817
1877	75.13	99.0	54.0	8	11	5.76	8	32.04	73.4	0	8,355	29.091	29.355	28.865
1878	78.40	98.0	58.0	15	7	4.30	4	31.29	78.2	0	7,974	29.073	29.265	28.739
1879	79.14	97.5	62.5	16	9	3.66	4	34.90	73.8	1	6,980	29.040	29.219	28.884
1880	75.75	98.0	54.0	13	8	2.34	5	28.28	68.3	0	9,312	29.106	29 335	28.926
1881	79.74	102.0	57.5	18	6	2.28	2	26.23	72.5	1	7,541	29.098	29.314	28.761
1882	72.05	99.0	52.0	11	9	4.03	3	38.92	75.0	0	7,464	29.122	29.410	28.893
1883	76.18	96.5	56.0	17	10	7.23	5	39.46	71.4	0	10,901	29.086	29.381	28.679
1884	76.93	98.0	60.5	10	15	5.18	5	41.67	71.7	1	8,733	29.004	29.289	28.809
1885	77.06	96.0	56.0	17	13	6.03	5	43.76	72.9	0	8,422	29.065	29.265	28.873
Mean	78.15	98.1	58.8	15	10	4.61	5	38.30	72.7	1	8,793	29.074	29.307	28.807

EDITORIAL CABINET.

ELECTRIC MOTORS FOR STREET CARS.

In the progress of electrical mechanics we have at length reached a point where the predictions of Prof. Joseph Henry, made fifty years ago, are in a fair way to be realized. We are constantly hearing of new contrivances for moving machinery and conveyances by electricity, and, while the most of these have not proved practicable, yet, the promise of ultimate success has been always hopeful. Among the new candidates for public interest the "Henry Electric Railway system" presents, perhaps, the most practicable scheme yet devised for moving cars by electricity. It is the invention of Mr. John C. Henry, a citizen of Kansas City and already favorably known among inventors by his Velocimeter and Fire and Police alarm. If the experiments thus far made are any index of the success of the invention, we may feel assured that the question (a difficult one for Kansas City) of rapid transit is practically solved.

We have been in the habit of abusing the operators of street-car franchises in Kansas City very virulently, for some time past, for the shabby cars, the rat-like mules and the slow pace so characteristic of the lines heretofore operated here. In many respects this abuse was merited; but in others it was unjust. In building the earliest, as well s the latest lines here, the one great bstacle to overcome has been the 'ong as the motive power was confined to draught animals, the cars had to be reduced in size to reduce their weight. This necessitated a narrow track and a narrow track necessitated small teams. Two moderately sized horses cannot walk abreast on a narrow gauge track; and as small mules are in every way preferable to ponies as draught animals, it is attributable to these facts, as much as to any want of enterprise in Corrigan or other managers, that our service has appeared so contemptible.

Our grades, then, being the cause of past inefficiency in street-car facilities, we should encourage in every possible way the introduction of systems which overcome the difficulties they present. That they can be overcome has been very thoroughly proven by the success of the Cable Railway, which is operated over the most trying route in the city. There would be little necessity for anything better than this if it were not for two important factors in operating it: (1) it is an extremely costly road to build; and (2) the running expenses are very heavy compared with other systems. These facts would prevent the extension of the system over all the street-car lines of Kansas City for many years, at least; and in the mean time with what shall our present miserable facilities be replaced?

According to a report of Mr. Henry, to the company formed to exploit his invention, it appears that the experiments already made show the feasibility of his invention, even over streets so rough as those of Kansas City. The plant used by him is a car fitted with a ten-horse Vandepoele motor, a twenty-horse Vandepoele generator and a twenty-five-horse stationary engine. The track is about one-third of a mile in length and includes a seven per cent grade on a very difficult curve. It is an ordinary street-car track and very rough and presents, among other difficulties, a switch so poorly constructed that the utmost care must be used to prevent derailment in crossing it. Notwithstanding these difficulties a speed of fifteen miles per hour on levels has been obtained, and eleven on a four per cent up grade. It is contended that, with the power now used, four similar cars can be operated as well as one, as the invention includes a contrivance by which all cars descending grades generate, instead of consume, electricity, and thus help those ascending and on levels.

If these claims are justified by the facts, there will soon be no excuse for retaining our present mule cars with all their vexatious incidents; and it will add immensely to the beauty and reputation of Kansas City when they are gone.

SCIENCE AND THE PUBLIC.

It is a mistaken opinion, but a current one, that science, as a study, has no practical value to man beyond the mere mechanical and industrial wants it ministers to. A scientist may be a "crank" and yet the two terms not be synonymous. It is true there are many branches of science which seem to possess neither interest or utility in the every-day affairs of life; but if we give them even a casual study it will be apparent that there is nothing in science "caviare to the general." The utility of the mathematical sciences is unquestioned by all, and even many of the natural sciences like geology, bottany, physiology, etc., etc., are taught in our common schools from a general recognition of their value. But beyond these, in those obscure and difficult paths which lie apart from life's immediate necessities and gratifications, there are utilitarian objects concealed which can only be discovered and appropriated to the use of man by some devoted "crank" who is content to labor for the mere love of it. In archæology, for instance, beyond the artistic side of it, there seems to the average man to be no content except food for curiosity. Yet all will acknowledge the uses of history in the study of social questions, and ancient history, as we read it in this century, is largly composed of facts drawn from archæology. No student of to-day, unless he has matriculated in some cloistered academy where modern progress has never penetrated, pays much heed to the legends, except as legends, which, not many years since, made up the staple of history. Why is this? Simply because a class of savants, residuary legatees of the old antiquaries, have not been prevented by public ridicule and misapprehension from doing the work which brought this about. In Missouri a few years ago, we had a state entomologist whose devotion to his duties and intelligence in performing them were matter of comment wherever known. This was the eminent entomologist, Prof. C. V. Riley, whose genius and knowledge has since been so well recognized all over the world. Now instead of retaining this man of science to help the farmer in the fight with insect foes of his industry, the cry of "bug-catcher" was raised against him in a bouffe Legislature and the office was abolished. Yet what cultivated man doubts to-day the practical nature of entomological science.

Even as to those scientific studies which children are allowed to mingle with the bable of dead languages in our high schools, no encouragement is given them by parents to retain and use what they were taught. A popular scientific periodical would be read by most young men and women with as much interest as a literary magazine, and with infinitely more profit.

The signs of the times are strongly predictive of a change in popular feeling on this subject; and such a change means a wider and more utilitarian culture for the coming man. He must be able to do more than quote Greek hexameters or spout Cicero. Education will mean, not memorizing antiquated ideas or crowding the mental apparatus with worthless rubbish, but an acquaintance with nature and nature's methods. It is only by means of such an education that man, as recipient of nature's bounty, is rendered capable of taking all that the universal mother offers her children.

GENERAL GRANT.

The Review desires to testify its sincere participation in the national grief over the death of a great American. Now that he has joined the "silent majority" we can appreciate the character of the soldier and statesman, who was [illegible] ıd so maligned during his life-time. That this character was one which won upon the whole people, through all attacks of slander and malevolence, is made evident by the universal voice of a mourning nation. His elegy need not be written now. The pages of history and the hearts of fifty million people will preserve his memory better than the chime of rhyme and grace of oratory. In spite of partisan license and personal enmities, the Republic has not been ungrateful to Grant. He who walks far above his fellow-men is too fair a mark to pass scathless through his career; and Grant was no exception to the common lot. Yet the people will always see justice done to their servants and they were true to the great General.

He will live as the hero, not alone of this Nation, but of the world. No Roman Consul or Emperor ever gained a triumph such as was bestowed upon Grant during his tour around the world. Europe, Asia, Africa, as well as America, raised monuments to his memory in their annals for the year 1879.

But this universal recognition of our great countryman was not mere hero-worship—not the apotheosis of deeds as represented by their accomplisher. The personality of Grant is a living factor in his reputation over and above his achievements. All who had the privilege of seeing him during life can understand what is meant by "individuality." It was the individual who gained the world's respect and love; it was the succesful leader of armies, the President of the Republic, who received the din and uproar of its plaudits and laudation.

It is hoped that the rather careless typography of the Review this month, will be forgiven by an indulgent public. The "devil" must have read the proofs instead of the proof-reader.

The plan of placing the names of contributors in the Table of Contents, alone, has been adopted by the Review. If there is objection to this course, the Editors are amenable to reason.

We ask our friends to aid us in increasing our subscription list. We are trying to give a full equivalent for the subscription price, but it is obvious that every increase in the number of our patrons will add to our resources, and help us that much to increase the interest and value of the Review.

Subscribers for the Review who take other periodicals, would do well to take them through this office. We have made such arrangements with the publishers of several Magazines, that we are able to offer very desirable inducements to our patrons. Please correspond with us on the subject.

The present volume (IX) of the Review will close with the December number. This will give but five numbers to the volume, but as these numbers will be larger than usual, our subscribers will lose nothing, even if we ask the full subscription price. We have determined, however, to fill out this volume for $1.00,—that is the five numbers, from August to December, inclusive, will be sent to subscribers for that price.

The attention of the public is directed to the value of the Review as an advertising medium. Its patrons comprise a large proportion of the most substantial, intelligent and energetic people of the entire west, as well as of Kansas City and vicinity. Among them are included school-teachers and other educators, men of science, business men, lawyers, doctors, clergymen, inventors, mechanics, etc., in fact the very best classes of the community. Our rates are very reasonable, and will be sent to anyone desiring to know them.

CORRESPONDENCE.

SCIENCE VS PHRENOLOGY.

Mr. Editor:—Sometime in February last, I read a paper before the Kansas City Academy of Science, entitled the "New Phrenology." It was a popular title, and I was somewhat ashamed of it, inasmuch as it took an old name, which has covered much pretense and error, and applied it into what we hope may grow into a science. I passed over the phrenological part as lightly as possible, under the circumstances, for I was aware that its pretensions have little recognition in scientific circles and to repeat them was much like making a crusade against the dead. It seems, however, that what little I did say found two critics, in the Phrenological Journal. One of them, a certain I. P. Noyes, complains in peculiar english, because the article was "weak." For his sake I am sorry that I did not make it stronger. That I advanced some "great truths" I think must be acknowledged even by the gentleman himself; that they were my own discoveries I did not pretend. The Rev. Sam. Jones says: "If you throw a stone into a crowd and some dog runs off howling, it's generally a sign that he's hit" To this I would add, that he generally howls because the stone that hit him was not harder and heavier. In the July number is another article entitled "Critical without Knowledge." Since this appears in the editorial department, I presume that it was written by the editor [illegible] He does not impute "un-[illegible]" to me. His chief object in calling attention to me is for the purpose of showing how intelligent men, students of medicine, will make erroneous declarations, simply because of their ignorance of the subject they presume to criticize." Since he has made the issue one between "unworthy motives and ignorance." I am glad to find that he has shown on which side the ignorance lies. The sentence in question is this: "Memory we now know is no special, localized organ or power. Phrenologists placed this, if I remember rightly, somewhere in the middle of the forehead, where the two tables of the skull separate and leave a cavity between them called the frontel sinus." To this the editor comments, "it is evident enough to every one conversant with the philosphy of the subject that the writer indicates sheer ignorance of its rudimentary principles. The fact is that the idea of memory having no special organ or seat as a separate entity in the brain was early taught by phrenologists."

There is a little book called the "Practical Phrenologist, &c., by O. S. Fowler," which contains on nearly its first page a chart of the so-called faculties. On this chart the region in question is covered by "Eventuality." Underneath, eventuality is defined as "memory of facts, events, &c." This is pure memory then,—as nearly as it can be defined, and in accepting Mr. Fowler as the best living phrenological authority, I have shown my ignorance. I was aware at the time I wrote the above lines, that Dr. Caldwell, the earliest and strongest advocate of phrenology that this country has produced, advocated the non-localization of memory in an article published in the Transylvania Medical Journal, forty years ago. In prefering Mr. Fowler however, I was simply trying to give the latest knowledge upon the subject, and so fell into error. In Mr. Fowler's book, on page 251, where eventuality is further explained, the comment after "very small" is, "Forget almost everything." No further comment is needed here, and it fully explains the reason of my ignorance; but how is it with unworthiness of motive, when Phrenologists say one thing publicly in one place and attack a person for repeating it in another!

I am afraid, Mr. Editor, that I shall trespass too much upon your space, but there is another point on which I wish to speak. That is in regard to Mr. Fowler's idea of the nature of knowledge. He made no objection to my phraseology, when I called memory "the store-house, the arsenal of the mind." "Every intellectual organ has the property of memory; its special impressions are gathered and garnered." This may be a loose way of speaking, like some of the rest of his utterances, matters for later interpretation, but certainly he must be aware of the fact that knowledge is only a modification of brain substance in accordance with outward impressions, and there can be no such garnering process as he mentions. If such ideas as these are the logical outcome of Gall and Spurzheim's teachings, they certainly have not advanced science much. I think however that I gave Spurzheim full credit in the paper before mentioned, for what he did.

Respectfully,

J. B. Browning, M. D.

THE ANATHEMA OF SCIENCE.

Mr. Editor: It has become so thoroughly settled, as orthodox scientific doctrine, that psychology is merely a branch of physiology that it is somewhat perilous to risk one's reputation by paying much heed to the claims of animistic theorists and experimenters. Prof. Elliott Coues, the author of "Biogen," and, since, a well known theosophist, has felt the full force of the above remark in the treatment he has received from scientific men; and Prof. Crookes, A. R. Wallace, Prof. Zollner and Robert Dale Owen suffered in the same cause.

Now it is rather questionable whether science is the gainer by this policy of ex-communication; whether materialistic theorists and experimenters are loyal to science in looking at but one side of the shield which nature sets up for their inspection. It must be remembered that little of the physical progress of modern times is the result of conscious deductions from approved principles—that accident, rather than reason, gave us the vantages from which we have progressed to our present advanced position in physical knowledge. Chemistry is the off-spring of Alchemy and Astrology was the parent of Astronomy. Yet in neither of the modern sciences is there retained a single incentive that moved the votaries of their prototypes to unremitting toil and study. Out of the vagaries which prompted the cultivation of these ancient mysteries, true science founded a correct knowledge of chemical processes and astronomical laws. Of all the great discoveries in science and the mechanic arts that have blessed our age, how few can be enumerated which were the result of constructive invention! A lazy boy invented the automatic valve-movement of the steam engine, without a thought of benefiting mankind; gunpowder was the discovery of a monk who sought the philosopher's stone; and thousands of similar instances could be adduced. Even the discovery of the New World was fortuitous,—indeed the discoverer lived and died in the belief that he had simply found a new and shorter route to India.

Acknowledged leaders of scientific opinion, such as Professors Tyndall and Huxley, have been requested on several occasions to investigate alleged phenomena claimed to be subversive of known laws of nature; but they have generally refused with the statement that such investigations possessed no interest for them. And recently a member of the London Society for Psychical Research was told by Helmboltz that he would not believe in the results of the Society's experiments if he should see them performed himself. This is not the scientific spirit. If all savants were of like opinion the whole field of alleged supernatural phenomena would be left to either shrewd imposture or credulous ignorance. If the phenomena is imaginary, the result of subjective conditions not objective impressions, it will require a trained scientific student to find the thread of the tangled skein of circumstance. If the phenomena are genuine, then it will require a hierophant of the same character to harmonize them with natural laws and destroy the germs of superstition. This work has been attempted with honest enthusiasm by Beard, in this country, and Carpenter, in England, with gratifying results; but the subject is still left in a most chaotic state so far as true science is concerned. Their experiments and inductions do not fit the many cases of "thought transference" reported by either the London or the American Society for psychical research. If there is a possibility of transferring our cerebral impressions to the consciousness of another without audible, visible or tangible speech, it is within the domain of science to discover and make it known; if the whole matter is a delusion, the world should be assured of it, not by a dogma of science, but by the overwhelming refutation of experiment. It may be that even the unclean mystery of spiritism may conceal a science as important to mankind as either chemistry or astronomy. W.

ITEMS FROM PERIODICALS.

MENTAL ODDITIES OF GREAT PEOPLE.

The lowest grade of mental disturbance is seen in that temporary appearance of irrationality which comes from an extreme state of "abstraction" or absence of mind. To the vulgar, as already hinted, all intense preoccupation with ideas, by calling off the attention from outer things and giving a dream-like appearance to the mental state, is apt to appear symptomatic of "queerness" in the head. But, in order that it may find a place among distinctly abnormal features, this absence of mind must attain a certain depth and persistence. The ancient story of Archimedes, and the amusing anecdotes of Newton's fits, if authentic, might be said perhaps to illustrate the border-line between a normal and an abnormal condition of mind. A more distinctly pathological case is that of Beethoven, who could not be made to understand why his standing in his night attire at an open window should attract the irreverent notice of the street boys. For in this caşe we have a temporary incapacity to ,perceive exterior objects and their relations; and a deeper incapacity of a like nature clearly shows itself in poor Johnsons standing before the town clock vainly trying to make out the hour.

This same aloofness of mind from the external world betrays itself in many of the eccentric habits attributed to men and women of genius. Here, again, Johnson serves as a good instance. His inconvenient habit of suddenly breaking out with scraps of the Lord's Prayer in a fashionable assembly marks a distinctly dangerous drifting away of the inner life from the firm anchorage of external fact.

In the cases just considered we have to do with a kind of mental blindness to outer circumstances. A further advance along the line of intellectual degeneration is seen in the persistence of vivid ideas, commonly anticipations of evil of some kind, which have no basis in external reality. Johnson's dislike to particular alleys in his London walks, and Madam de Stael's bizarre idea that she would suffer from cold when buried, may be taken as examples of these painful delusions or "idees fixes." A more serious stage of such delusions is seen in the case of Pascal, who is said to have been haunted by the fear of a gulf yawning just in front of him, which sometimes became so overmastering that he had to be fastened by a chain to keep him from leaping forward.—From "Genius and Insanity" by JAMES SULLY, in Popular Science Monthly for August.

COAL USED BY THE ANCIENTS.

We have received from the Rev. Joseph Hurst, of Wadhurst, England, a pamphlet copy of his very interesting address read at the meeting of the Royal Archæological Institute of Great Britian and Ireland, at Newcastle, on August 6, 1884, the subject being the mining operations of the ancient Romans. We are unable to lay this address before our readers, but we cannot omit a reference to a most curious part of it. The use of coal (pit-coal, or bituminous coal,) by the Romans during their occupation of Britain, which terminated in the year 311, is well authenticated, but that either the Romans, the Greeks, or any other ancient nations used coal prior to the period mentioned, or prior to the Christian era, has not, we believe, been so well settled. The author of the address before us throws much light on this interesting problem. He says: "That the ancient Greeks were acquainted with stone coal is evident from the words of Theophrastus, an author who lived three hundred years before Christ (de lapidibus No 16): 'The coal commonly so-called, which is dug out of the earth for man's use, is of an earthy (or stony) nature; it is kindled and burned like coal (charcoal). Of this (stone) coal workers in iron make use.' Solinus has also been quoted for the use of stone coal among the Greeks, and if the red-hot stones which, according to Pliny, were used by the Gauls for smelting copper, were nothing more than stone coal, their efficacy would perhaps be rendered more intelligible to modern men of science." This reference to Pliny will be found in H. N. xxxiv, 20. Mr. Hurst's quotation from Theophrastus does not tell us in what country the coal referred to was found.

There is some other testimony to sustain Mr. Hurst's statements. In Johnson's Cyclopædia Mr. John B. Pearse, the compiler of the paper on iron, says of the Chalybes, who inhabited a part of the Asiatic country south of the Black Sea, that they "first used coal." He fortifies this statement in the following words: "Their iron was made, according to Aristotle (322) B. C.,) from sand ore dug from river banks, washed, and put into the furnace along with the stone pyrimachus, (fire-maker,) that is, coal." There is coal on the southern shores of the Black Sea, between the ports Heraclea and Bordin, which is now mined in considerable quantities, and it is probable that, if Mr. Pearse's inference from the statement of Aristotle is correct, the Chalybes obtained their supply from this source.—Bulletin of Iron and Steel Association.

TO CLEAN MARBLE.

Brush the dust off with a piece of Chamois, then apply with a brush a good coat of gum arabic, about the consistency of thick mucilage; expose it to the sun or wind to dry. In a short time it will peel off, wash it with clean water and a clean cloth. If the first application does not have the desired effect it should be tried again. Another method is to rub the marble with the following solution: One-quarter of a pound of soft soap, one-quarter of a pound of whiting, and one ounce of soda, and a piece of stone-blue the size of a walnut; rub it over the marble with a piece of flannel, and leave it it on for twenty-four hours, then wash it off with clean water, and polish the marble with a piece of flannel or an old piece of felt; or take two parts of common soda, one part of pumice-stone, and one part of finely-powdered chalk, sift it through a fine sieve and mix it with water, then rub it well over the marble, and afterward wash the marble with soap and water. To take stains out white marble, take one ounce of ox-gall, one gill of lye, one and a half table-spoonfulls of turpentine; mix and make into a paste with pipe-clay; put on the paste over the stain and let it remain for several days. To remove oil stains, apply common clay saturated with benzine. If the grease has remained in long, the polish will be injured, but the stain will be removed. Iron-mould or ink spots may be taken out in the following manner: Take half an ounce of butter of antimony and one ounce of oxalic acid, and dissolve them in one pint of rain water; add enough flour to bring the mixture to a proper consistency. Lay it evenly on the stained part with a brush, and after it has remained for a few days, wash it off, and repeat the process if the stain be not wholly removed.—Journal of Commerce.

GOING UP THE INDIANAPOLIS ELECTRIC TOWER.

Last week a number of persons took the elevator and mounted to the basket at the top of the electric light tower in Circle Park, Indianapolis. Among these were Harvey Bates, J. C. McCutcheon, Philip Igoe, and Arthur Edmunds. Mr. McCutcheon, in going up, took with him a thirty-five dollar field-glass, intending to indulge in a view of the city from the giddy height. In ascending, he forgot to take his foot off the brake, and when he got to the top his head struck with such force that he thought his nose and chin had telescoped, and the field glass fell to the ground, where it was broken into pieces so fine that a 500 diameter microscope would not have been equal to the task of finding the pieces. Arthur Edmunds was the only one of the party who had sufficient hardihood to mount into the basket, and Joe Elliott, as a spectator, was much disturbed at the deficiency in nerve that was thus exhibited. "When I was a boy," said Mr. Elliott, "I was a great climber. There was not anything I was afraid to tackle. I have climbed shellbark hickories more than ninety feet high."

This famous climber was easily induced to get into the elevator, but as he mounted upward he began to complain. He said his feet ached. It had been so long since he had had them such a distance from the ground that they grew dizzy, and so he came down again.

As he stepped on terra firma a ribald newsboy yelled out, "Say, mister, where is that old hickory nut nerve o' your'n, anyway?"

The men who have the tower in charge are very accommodating, and a large number of gentlemen have taken advantage of the opportunity to view the city.—Electric Review.

WHY THE SWISS CAN DRINK SO MUCH.

Owing to the small proportion of moisture in mountain air and the low barometric pressure, evaporation is very rapid. Even afer the heaviest rain the ground dries in a few hours. This quality of the air tends to make perspiration more profuse and the skin dry faster than is the case at lower elevation. There is greater thirst, the tissues waste faster, and a high authority has said that a man's tissue is the only thing which it is his duty to waste, new tissue being out of all comparison better than old.

It is probable to this rapid evaporation at great heights and the thirst which it engenders that the Swiss have to thank for their wonderful drinking powers. The other week the marksmen of Canton Vaud held their annual rifle meeting at Payerne, a picturesque village on the Broye, and the local papers mention with something like pride that the shooters and their friends drank the place dry.

Everybody who has been in the highlands of Scotland, or any other mountain land, and tried the experiment, knows that he can drink with impunity much more whiskey, or whatever the vin du pays may be, than he can drink at home. This, it may be as well to observe, is mentioned as a dry fact, not as an additional reason for going to the mountains.—London Times.

A QUEER SUPERSTITION.

Abram Reed, a farmer living in Beaver township, Pennsylvania, cut down a large oak tree on his farm, and in cutting it up he found, embedded in the trunk, seven or eight feet from the ground, a small glass bottle and what had the appearance of a lock of hair. The bottle had been inserted in a hole in the tree made by an auger, then a pine plug was driven into the hole over the bottle, the hair also being held in the hole by the plug. The bottle was corked, and contained a colorless liquid. Over the plug had grown six solid rings of wood, besides a thick bark. There was a superstition among the early settlers, and it is held by many of their descendants that asthma and other affections could be cured by the victim standing against the tree and having a lock of his hair plugged in it while the hair was still attached to his head. It must then be cut off close to his head, and the afflicted person walk away without looking at it or ever passing by the tree again. While the use of a bottle was not included in this treatment, it is believed that the one with the hair discovered in the heart of the oak tree was put there in the early days of the settlement by some believer in the superstition to cure an ailment of some kind.—Lumber World.

MISCELLANY.

SURGICAL EXPLOITS—WHAT IS DONE IN THE AMPHITHEATERS OF THE MEDICAL SCHOOLS.

You have already read about the curiously successful surgery which a girl of this city underwent, writes the New York correspondent of the Chicago Journal. Having lost a section of the principal muscle from one arm, and being thus incapacitated for work, the surgeons of Bellevue hospital inserted the lacking material from a Newfoundland dog, patched up the wound, made it heal, and finally restored the arm to usefulness. The girl was under ether while the operation was going on, and a knowledge of its nature was kept from her until a cure was complete. The particulars were given to the reporters, and she got the news simultaneously with the rest of the public.

"You ask me what is, or what may be, the effect on the imagination of the girl?" said the surgeon with whom I talked. "Well, she happens to possess strong nerves and general good health. She seemed a litle shocked on learning there was a canine annex to her arm, and she was anxious right off, to know what sort of a dog had contributed the material. He had been killed immediately after the operation, because it would have left him badly maimed. She said she was sorry for that, as she would like to have had him to keep. She was delighted to be told that he was a fine specimen of his she'd never, never had forgiven us if we had used a Spitz, or a bulldog, or any ugly brute. A fashionable pug might have pleased her, yet on the whole she thought she would have chosen a Newfoundland if the selection had been left to her.

"She is a laundry girl, and probably not given to the consideration of fine mental or physiological theories, and so it is left to you professional writers to speculate on the effects of the amalgamation. There are persons so finicky that, everytime they coughed after a piece of dog had been engrafted into them, they would imagine that they were barking; and death by imaginary hydrophobia would be a possibility, but in this case I don't anticipate any trouble of that sort.

If Annie Pennell had died from the failure of the dog's flesh to heal with her own, no mention would ever have been made in print of the dangerous experiment. Only the surgical succeses are given to the world, the failures are suppressed. Nothing was known by the newspapers of this case until two weeks after the operation when the arm was restored to its original value. That very many exploits in surgery come to deadly ends cannot be doubted. They are performed in the center of a small amphitheater where the students of one or another of the medical schools meet on appointed days to be practically instructed, and the surgeons lecture explanatorily as they work, telling what they are doing and the expected results.

"If there is a success," says a student to me, "the patient is usually exhibited to us again, to the glory of the operator; but many and many a case is never seen or mentioned in a clinic afterward, and the supposition is that deformity or death has been caused. The subjects are usually poor persons—gratis patients in the hospitals—and the surgery on them is largely in the nature of vivisection. That is, they are made to stand the risk of experiments which may and may not turn out well.

"If Gen. Grant had been an unknown patient in a public hospital, there would have been a knife in his throat ere this; and he might have gained by it, too; but surgical experiments, mind you, are not tried on illustrious persons. Naturally the surgeon makes his novel and perilous feats under circumstances which will hide his failure. I am not blaming him, either; and it is a fact that about all the progress in both medicine and surgery is achieved through tests of theories in the hospitals. The subjects are usually in a hopeless condition; they do not dread the ordeal, for its nature is not explained to them; and often they are restored to health, besides contributing to the stock of science."—Ex.

GEARING FOR MOTOR CARS.

An English inventor of electrical motor cars in presenting his claims to an Electrical Society, laid great stress on his contrivance for reducing speed. It is known that the helix of a motor makes from eight hundred to one thousand revolutions per minute. Of course this rapidity of movement cannot be applied directly to the axle, as the speed, in that case, to say the least, would depend upon the resistance to be overcome and would have no regularity. The English invention consists of a "worm," revolving in oil, which reduces the motion, while communicating it to the axle, to about one in twelve. Mr. Henry, of this city, has devised gearing, which not only reduces the number of revolutions, but puts it in the power of the driver to run at any exact rate of speed desirable over gradients and levels alike. This, too, without loss of power—power and speed being interchangeable. This contrivance is a part of his system of electric appliances for moving street cars.

THE SENSE OF TASTE AND SMELL.

How much of the pleasure of living comes from the exercise of the little considered sense of taste or that of smell it is hard to estimate. Harriet Martineau, the English authoress, seems to have been one of the few persons having no sense of taste, as a recent writer asserts that she was entirely destitute of it. She reported that the faculty came to her once, when the deliciousness of a leg of mutton aroused an eager anticipation of the enjoyment of her next dinner; but nothing came of it, for her tasting power was withdrawn as hastily as it had been given. The sense of smell was also denied her, as it was Wordsworth. In his case the lacking sense also appeared on a single occasion, when he "smelled a beanfield and thought it heaven."—Ex.

SONOROUS BEACH SANDS.

According to late papers by Profs. Julien and Bolton, sonorous beach sands are far from being the rarities they were considered some years ago, as they are already found in seventy-four American and thirteen foreign localities, and the number is constantly increasing. When suddenly compressed between the hands, musical notes are emitted by these sands, the pitch rising as the quantity is diminished. The loudest sound may be made by suddenly bringing together two divided portions of sand enclosed in a bag. Prof. Julien considers that the conditions of sonorousness are perfect dryness, uniformity of grain ranging from about one-tenth to one-fifth of an inch in diameter, and freedom from dust. He thinks that any sand satisfying these conditions may be musical. When wet, sonorous sands generally become quicksands.

STORAGE BATTERIES.

Some of our electrical exchanges are quite enthusiastic over the success of the new Bouer storage cells, in driving motors for street cars. The great obstacle to be overcome in the use of storage cells are (1) irregularity of current; (2) the space required for placing them, and (3) the great additional weight they give to the car. Notwithstanding the great confidence expressed over the recent experiments with storage cells in England and on the Union Railway, Baltimore, the results, as to speed and economy are largely with the Henry conductor system of Kansas City.

THOUGHT TRANSFERENCE.

The American society for physical research, of Boston, has recently, through its committee on thought-transference, been engaged in a series of experiments similar to those of the English association which have attracted so much attention. The success of these experiments does not seem to have been so remarkable as those performed across the water, yet the results are rather confusing to any one who has heretofore been satisfied with the explanations of Beard and Carpenter.

OBITUARY.

Science has been recently deprived of some of its ablest votaries by the death of Rev. T. W. Webb, of Hereford, England, and Prof. Henle, of Gottingen, in May last, of Prof. Fleeming Jenkin, of the University of Edinburgh, in June, and of Lieut. Tilly, commander of one of the German West African exploring expeditions, Alex. Carroll, curator of the Smith Institute, Sterling, Scotland and Alex. Murray, late of the Canadian geological survey, all during the early part of the year.

AURORA BOREALIS.

Sophus Troucholt has exploited a new theory to account for the Aurora borealis. He holds the opinion that the fundamental phenomena is a ring of light encircling the Arctic regions, and that all the various forms obscured are due to modifications and imperfections in this ring.

NOTES.

Mr. O. Chanute, in his paper on the cost of railroad freight traffic, published in the Railway Review of May 2d and 9th. has made a timely contribution to the popular as well as the professional discussion of the railroad-rate problem. We think the whole history of the war of legislatures on the railroads show that what the people who influence the legislatures really want is justice. That they often try to force conditions that are not just, is true enough; but that is largely due to a general ignorance of the conditions which they endeavor to control. Nothing can be more wholesome than to discover and make known, not in misleading "averages," but in detail, the cost of the service rendered by railroads in moving each class of freight. Mr. Chanute suggests a practical formula by which this cost may be ascertained, and the values for which may be determined by each railroad company for its own special circumstances. For purposes of illustration, he applies his formula to approximately determined data on the New York Central; and the resulting tables show that the actual cost of handling and moving different classes of freight varies from 0.42 cent to 3.11 cents per ton per mile Westward, and from 0.37 cent to 9.55 cents per ton per mile Eastward.

With the probabilities strong that the cholera may reach the United States this year, it is essential that people should, above all other things, look well to the water they drink. Impure water provokes sickness and disease under the most favorable circumstances; but when contagious and deadly diseases are lurking around the danger is then all the greater, for bad water is a slow but sure poison. That much of our drinking water is vilely bad goes without saying. A very simple way to purify water is given by the State geologist of New Jersey, in the making of a cheap but excellent filter: It is the bottle filter, and is made by "tying a string wet with turpentine around the bottom of a quart bottle and breaking out the bottom. This is done by lighting the string, and, when the flame has encircled the bottle, dipping it in cold water. Layers of fine cotton batting must then be placed in the bottle until a wad is collected that rests on the shoulders of the bottle and over its neck. Now dissolve a cup of alum in hot water and pour the solution into a cup of cold water. This makes a filtering substance. I use alum because it is the only thing which will precipitate all impurities of the water to the bottom. For every gallon of water that is desired to purify, add a teaspoonful of the filtering fluid, and stir it until every particle of the animalcula is precipitated. This usually takes about five minutes. Then run your gallon of water thus treated through the filter, and you will have your water free from all impurities."

Colonel Prejwalski, the well-known Russian explorer of Central Asia, writes to the Geographical Society at home, that he has discovered gold mines, worked by the natives of Thibet, so extensive that he ventures the opinion that this country will prove the equal of California in this precious mineral. Near the head of the Hoang-ho, on the southern slope of one of its tributaries, he came across some thirty Tawgots engaged in a rough sort of placer-mining, taking the gravel from a depth of only one or two feet, and yet, as a result of this ancient method of obtaining the gold, the natives had great quantities of the mineral in large pieces, none of them being smaller than a pea. Of course, civilized handling of the deposits would make such gravel pay enormously at small outlay, and the deposits are of the most extensive character, the whole northern part of Thibet being rich in such areas.

The Scotsman says: "Only a few years ago it was the height of rashness or of heroism, for an infidel to set foot in Mecca. Burkhardt and Burton won their spurs by venturing in the disguise of pilgrims, within the most sacred city of Islam. The telegraph has changed all that. Mecca, in spite of its triple protection of desert mountains, robber tribesmen and Mussulman fanaticism, is about to go down before the post of the telegraph constructor. In a few weeks the birthplace of the Prophet will be in direct communication with the newsmen of Fleet street, London. Messages will be sent and delivered within a stone's throw of the rock which fell from heaven to mark the site of Paradise and of the sacred well which has for so many centuries distributed relig[illegible]uences and the germs of cholera [illegible]mong the Faithful.

Dickens has been much criticised for his apparent acceptance of the fact of spontaneous combustion, but Sir William Gull lately testified to a surprising case before the committee of the house of lords on intemperance. A large, bloated man, who was suffering from difficulty of breathing and distension of the venous system, died at Gup's hospital. At the post-mortem of the following day there was no sign of decomposition, and the body was believed to be distended with gas. "When punctures were made into the skin," said Sir William, "and a lighted match applied the gas which escaped burned with the ordinary flame of carbureted hydrogen. As many as a dozen of these small flames were burning at the same time."

The wood of the jarrah tree of Australia is probably the most durable known. It is proof, says the Industrial American, against insects and exposure, and ships built of it have sailed twenty or thirty years without copper. It will not grow on good soil, only where there is ironstone. One of the most remarkable facts about this timber is that if a bolt is put into it when it is taken out, a bolt of precisely the same size will go into the hole again. The effect of the iron is apparently to preserve the timber, and of the timber to preserve the iron.

The deepest boring yet made is at the village of Schladebach, near the line between Leipzig and Corbetha. It has been made by the Prussian Government to test for the presence of coal and was bored with diamond drills. Its depth is 1,390 meters (4,560 ft.); its their heroes with the factitious grandeur of blood-curdling periods and thundering adjectives; with them the style is everything, the hero nothing. There are some, like Boswell, who act the part of Ganymede to their Jupiter; with them the hero is everything, the style nothing. Between these two extremes there are many gradations; but few are they who find the happy medium.

Among the few biographies of the day which bear marks of adequate genius in their authors, one of the best is the work of Mr. Isaac N. Arnold, noted above. Biography is not an untried field for him. He has already gained some laurels there in a most difficult role—that of apologist to American readers, of the treason of Benedict Arnold. It might be thought that such a labor would be incompatible with an attempt to place before us the true characteristics and motives of a heroic patriot; but it must be confessed that the Lincoln of Mr. Arnold is not only the real Lincoln but he is so placed before us that we feel and recognize, if never before, the gigantic figure he made in deciding the destinies of his country. There is brought back so vividly before our minds the strife, the confusion, the consternation, the warring policies, which beat around the President in the dark days of the war, that, in the obscurity and the turmoil, the great Liberator alone seems to have retained the constancy, the firmness of purpose and policy, and the strength of patriotism to control the whirlwind and direct the storm.

There are few faults in the book of sufficient importance to point out. The author had barely prepared the MS. for the printer when he died; leaving the work of carrying it through the press to others. This has been well done. It is well worth a perusal even by those who are familiar with Lincoln's life and character.

FORESTRY.

Forests and Forestry in Poland, Lithuania, the Ukraine and the Baltic Provinces of Russia, with notices of the export of Timber from Menul, Dantzig and Riga. Compiled by John Croumbie Brown, L. L. D., &c., Edinburgh; Oliver & Boyd, London; Simpkin, Marshall & Co., Montreal; Dawson Brothers. 1885.

The subject of Forestry is of the utmost importance to a large portion of the west where the landscapes show only vast treeless prairies; yet it must be confessed that western enterprise has fallen behind the more conservative old world in sylviculture. In many of the countries of Europe, Forestry is taught as a profession, and schools are endowed by the Government for the purpose. In 1884 there was established at Edinburgh a National School of Forestry and a museum connected with it. Forest science being thus recognized, the making of books on the subject began. With characteristic pertinacity the canny Scotsmen set out to inform themselves about the Forestry of the world. Among the works produced, all by John C. Brown, were (1) Introduction to the Study of Modern Forest Economy; (2) the Forests of England, and the Management of them in By-gone Times; (3) Forestry of Norway; (4) Finland; its Forests and Forest Management; (5) Forest Lands and Forestry of Northern Russia; (6) French Forest Ordinance of 1669; with Historical Sketch of Previous Treatment of Forests in France; (7) Pine Plantations on Sand Wastes in France; (8) Reboisement in France; or Records of the Replanting of the Alps, the Cevennes and the Pyrenees, with Trees, Herbage and Bush, with a view to arresting and preventing the destructive consequences of torrents; (9) Hydrology of South Africa; or Details of the former Hydrographic Condition of Cape of Good Hope, and of Causes of its Present Aridity, with suggestions of Appropriate Remedies for this Aridity; and several others. These brochures have been supplemented by two more pretentious works, one noted above, the other on "Forestry in the Mining Districts of the Ural Mountains in Eastern Russia."

These books have given their author an eminence in Forest science hardly attained by any other living person, and contain the most valuable hints and suggestions as well as information. These should be made applicable in some way to the great plains of Kansas, Colorado, Arizona and Nebraska.

THE WALUM OLUM.

The Lenape and Their Legends; With the complete Text and Symbols of the Walum Olum, a new translation, and an enquiry into its authenticity. By Daniel G. Brinton, M. D; D. G. Brinton, Philadelphia, 1885. Price, $3.00.

Dr. D. G. Brinton's latest contribution (No. V.) to the Library of Aboriginal American Literature is not less valuable than its predecessors. It gives many legends of the Lenapes and redeems from oblivion an aboriginal chronicle which has long been looked upon askance by Americanists and denounced, by not a few, as a forgery of the eccentric Rafinesque. While Dr. Brinton's critical sagacity has not established beyond any question the authenticity of the Walum Olum, he has given it a respectable standing and placed it in a position where it must, very shortly, be either thoroughly discountenanced or verified.

The chronicle in question, known as the Walum Olum, or Red Score, consists of a series of chants of the Delaware Indians, including a cosmogony and a history of their wars and migrations. It appears to have been first obtained in hieroglyphic, or pictographic form, by one Dr. Ward, in 1820 and two years afterwards the verses were written in the original language. Rafinesque first translated and published them in 1833; but he stood in such disrepute that no one would countenance what was thought to be a fraud. The actual document therefore, is not ancient; but Dr. Brinton finds good reason to believe that the chants themselves are of considerable antiquity. The pictographs may possibly be many years older than 1820 also, but there is no way of determining that now.

Scholars everywhere should vie with each other in encouraging this laudable enterprise of Dr. Brinton. There are many specimens of aboriginal literary skill extant, which should be included in this library, as they are almost inaccessible at present.

OTHER PUBLICATIONS RECEIVED.

The Sun. A familiar Description of His Phenomena. By the Rev. Thomas William Webb, M. A., F. R. A. S., etc. Industrial Publication Company, New York, 1885.

Training-Schools for Nurses, with Notes on Twenty-two Schools. By W. G. Thompson, M. D. New York, G. P. Pulnam's Sons, 1883.

Essays, Speculative and Practical. By Herbert Spencer. Humbolt Library. J. Fitzgerald, Publisher, New York, 1885. 15 cents.

Local Institutions of Maryland. By Lewis W. Wilhelm, Ph. D. etc., Johns Hopkins' University Studies, Third Series. Baltimore; N. Murray, Publication Agent, Johns Hopkins' University, 1885.

The Lineal Measures of the Semi-Civilized Nations of Mexico and Central America. By Daniel G. Brinton, M. D., Philadelphia.

Remarks upon Chipped Stone Implements, and the First Notice of the Pine Grove or Forest River Shell Heap. By F. W. Putnam. Printed at the Salem Press; Salem, Mass., 1885.

An Account of the Progress in Anthropology in the year 1884. By Prof. Otis T. Mason. Washington, Government Printing Office, 1885.

A Descriptive Catalogue of the Grasses of the United States, etc. By Dr. George Vasey, Botanist of the Dep't of Agr., Washington, D. C. Washington, Gibson Brothers, 1885.

Certitude, Providence and Prayer. By James McCosh, D. D., L. L. D., etc. New York, Charles Scribner's Sons, 1883.

Notes on the Literature of Explosives, No. VIII. By Prof. Chas. E. Monroe, U. S. N. A.

The Periodical Cicada, etc. By Charles V. Riley, Ph. D. Washington, Government Printing Office, 1885.

Bulletin of the Philosophical Society of Washington, Vol. VII. Containing the Minutes of the Society and of the Mathematical Section for the year 1884. Washington, 1885.

Bulletin of the Brookville Society of Natural History, No. I. Richmond, Ind., J. M. Coe, 1885.

Researches on Solar Heat and its Absorption by the Earth's Atmosphere. A Report of the Mount Whitney Expedition. Prepared under the Direction of Brig. and Bvt. Major General W. B. Hazen, Chief Signal Officer of the Army by S. P. Langley, Director of the Allegheny Observatory, with the Approval of its Trustees. Washington, Government Printing Office, 1884.

This is No. XV. of the Professional Papers of the Signal Service and not the least important of them. It is a very exhaustive treatise on Solar Heat and possesses an interest beyond that of the more technical generalizations of science. To the meteorologist at least, the whole subject is of the first importance, especially so in its relation to selective absorption of heat by our atmosphere. The experiments of the expedition in this direction are interesting, and were performed by making independent simultaneous observations on the summit and at the foot of Mt. Whitney, Cal. The subject is too involved for a mere notice, but for those who feel an interest in the subject the present volume will prove a vade mecum.

Camp Fire, Memorial, and Other Poems. By Kate Brownlee Sherwood. Chicago, Jansen, McClurg & Company, 1885.

Most of the verses in the volume before us are evidently the outgrowth of Grand Army meetings. Considerable skill in versifying is manifested by the author and her productions are always readable, especially by one who participated in the valorous scenes described, or who can reall in memory the feelings of war-time. It should have a good circulation among old soldiers.

Report of Historical and Technical Information Relating to the Problem of Interoceanic Communication by Way of the American Isthmus. By Lieut. John T. Sullivan, U. S. N. Bureau of Navigation, Navy Department. Washington, Government Printing Office, 1883.

The same motive which actuated the earliest discoverers and explorers of the American Isthmus in seeking, with such indefatigable toil, for a passage at that point connecting the Atlantic and Pacific, is stronger now, so far as the needs of commerce are concerned, than in their day. More than then commerce is tending west-ward and seeking the easiest and shortest path-ways. If Columbus or Pedrarias, or even Capt. John Smith on the Chickahominy, had found the "secret of the strait" it is quite doutful if the Suez canal had been built; and in that case the late important military events in the East might never have occured. But the "secret of the strait" was not discovered and it is left for the present generation to create a strait where none existed. This is rather God-like work but the men of the nineteenth century are truly a little higher than the angels in their powers over nature.

The book before us is a faithful and interesting statement of the various plans, ancient and modern, to make a practicable passage for ships over the Isthmus of Panama. It is accompanied by maps, plans and cuts, illustrating the subject fully, and is written in a readable, and, even, occasionally, a graphic style. A portion of the literary work is credited to Prof. Nourse but Sullivan is entitled to full praise rying out the resolution of the Senate (upon which the book is based) in such a scholarly and intelligent manner.

We will, in a future number give an extended review of the book with the object of enlightening our readers on a subject now quite obscure to most of us.

PERIODICALS.

The contents of the August Magazine of American History are so varied and engaging that a brief summary gives no adequate notion of their importance and substantial worth. Any of its articles, except for the necessary sequence of arrangement, might be taken as leaders in point of excellence. It has four essays on the Civil War, of sterling merit, and an equal number on other historical topics of living interest. General Thomas Jordon's second paper on the "Beginnings of the Civil War in America," touches many controverted points in an able and fearless manner; Gen. Henry M. Cist writes a thrilling chapter on "Cincinnati with the War Fever, 1861;" Gen. John Cochrane discusses "The Charleston Convention," of which he was a member, showing its work and its results; the Editor in a personal sketch of "Major-General John A. Dix," describes the great Union Square War Meeting in New York, and the formation of the famous Union Defence Committee; Hon. James W. Gerard contributes a scholarly paper on the "Revocation of the Edict of Nantes," which so largely affected the population of America; Professor E. W. Gilliam, in "Presidential Elections Historically Considered," calls the attention of every voter in the land to the inconsistencies of the present electoral system, whereby the original text of the Constitution is inoperative; Ethelbert D. Warfield writes of "John Breckinridge, a Democrat of the Old Regime," unfolding some points in Kentucky history never before clearly defined. The frontispiece to this superb issue is an exquisite portrait in steel of Major-General John A. Dix. The pictures are by Theo. R. Davis, Harper & Brothers' famous War Artist, and the portraits of Jefferson Davis and his first Cabinet are given with much effect. The standing departments—Minor Topics, Original Documents, Notes, Queries, Replies, Societies, Bibliography of Historical Societies, and Book Notices—are admirably filled. Published at 30 Lafayette Place, New York City.

The Atlantic Monthly, for August, is a most enjoyable number. The story of the

Prophet of the Great Smoky Mountain ends most dramatically. We have in American fiction few stories more strange or successful than this or that have commanded more interest or attention. The story has been told in a fresh and delightful manner, and the life and character are unmistakably natural, though the reader may have no knowledge of them. The novelist has discarded the usual style of ending her story, and the close is both novel and satisfactory. If the story is published in book form, it should be in every house and library where a good story is welcomed. Charles Dudley Warner contributes another paper containing his experiences on horseback in the Carolina mountains. Oliver Wendell Holmes has further chapters of The New Portfolio, and Mrs. Oliphant's Country Gentlemen maintains its interest. E. R. Sill has an article on Should a College Educate, and P. Deming gives a very good short story on A Stranger in the City. James Russell Lowell and Oliver Wendell Holmes have each an Anniversary After Dinner Poem. There are a number of other very valuable papers. Published by Houghton, Mifflin & Co., Boston.

The July number of the Journal of Microscopy and Natural Science (quarterly) has been received, and is even more than usually interesting, containing articles on Cystopus or White Rust, accompanied by two lithograph plates showing the first appearance and gradual growth of the Cystopus and what plants are most generally affected; an interesting article on Mounting Beetles and other Insects without Pressure; What is a Plant? Chironomus Prassimus; Animal Metamorphosis, with plates; an instructive article on The Microscope and How to Use It; Diatoms in the Stomachs of Shell Fish and Crustacea; Structure of Diatoms; reviews, correspondence, and the usual number of current notes and memoranda. This journal is edited by Alfred Allen, secretary of the Postal Microscopic Society, at 1 Cambridge place, London, Eng., is issued quarterly, and is invaluable to a person studying nature in a scientific manner.

The North American Review for August, contains the following table of contents: Can Cholera be Averted? by John B. Hamilton, M. D., Supervising Surgeon-General of the Marine Hospital Service of the United States; John H. Rauch, M. D.; John C. Peters, M. D.; H. C. Wood, M. D., LL.D., and Charles A. Leale, M. D.; The Animal Soul, by Felix L. Oswald, M. D.; A Profane View of the Sanctum, by M. J. Savage; Temperance Reform Statistics, by Prof. Willis J. Beecher; The Price of Gas, by Charles Hull Botsford; The Spoliation of the Public Lands, by George W. Julian. The discussion of the cholera question is the most timely theme in the present number, and it is treated in a very lengthy and complete manner.

Van Nostrand's Engineering Magazine contains papers upon Engineering as a Profession, being an address to the Alumni Association of the Stevens Institute of Technology by William Kent, M. E.; Water Motors, by Charles Andre, illustrated, and translated from the French for Van Nostrand's; Cable Tramways, by W. M. Colam; Tempered Glass, by Frederick Siemens; a continuaton of Samuel Baxter's paper the Treatment of Timber; Technical Education, by Cunynghame; The Protective Power of Armour Plates, as Proved in Actual Warfare; The Evolution of Machinery, by Prof. H. S. Hile Shaw; and Chimney Construction, by R. M., and F. J. Bancroft.

"Concerning the Suppressed Book" is the title of the first article in the Popular Science Monthly for August. It is by Prof. E. L. Youmans, and is an examination of the Spencer-Harrison correspondence, which is given in full, and which ended in destroying the new book on religion shortly after its issue by the Appletons. The writer makes a strong showing for the American side of the case, and gives the whole mater a very different aspect from that presented in the English papers.

Mr. James Sully, in "Genius and Insanity," treats of the nature of genius as displayed in the careers of several distinguished personages, and of its relation to the general mental integrity of the individual. Dr. Mary Putnam-Jacobi describes "An Experiment in Primary Education," made by herself on her own child, in which, substituting the study of things for that of words, she obtained some very striking results well worthy the attention of our educators. Sir John Lubbock's illustrated article "On Leaves," begun in the July, is completed in this number.

"The Future of National Banking" is the subject of an article by Mr. E. R. Leland, who discusses some of the more important methods that have been proposed as substitutes for our present system, which is destined to pass away with the extinction of the National debt. Sir Henry Thompson's article on "Diet in Relation to the Age and Activity," begun in a former number, is concluded, and is followed by an interesting and instructive paper by Mr. George P. Merrill on "The Building and Ornamental Stones of the United States.

The addresses of Professor Huxley and the Prince of Wales at the presentation of the Darwin Statute to the British Museum are given, and there are also articles of much popular interest on "Measures of Vital Tenacity," by Dr. B. W. Richardson; Curiosities of Time-Reckoning," by M. L. Barre; and "Modern Bronzes," by Perry F. Nursey.

The sketch and portrait are of the distinguished French scientist, M. Michel Chevreul, who is now in the one hundredth year of his age, and still engaged in active scientific work. The "Editor's Table" and the other departments are characterized by their usual variety and interest.

Of all the periodicals which come to our table, none are more welcome than The American Naturalist. The contents of the July number keep up the established reputation of this Magazine. Among others the following papers are noticeable: "Evolution in the Vegetable Kingdom," by Lester F. Wood; "Ancient Rock Inscriptions on the Lake of the Woods," by A. C. Lawson; "Kitchen Garden Esculents of American Origin (Continued)," by Lewis Sturtevant; "The Relations of Mind and Matter (Continued)," by Charles Morris, etc.

The Journal of Science for July (formerly the Quarterly Journal of Science), London, is replete with interest and instruction. The first paper is a rather baffling contribution by the Count O. Reichenbach, on "Evolution as applied to the Chemical Elements." Other notable papers are "The Parasites of Civilization," and "Mr. A. R. Wallace, F. R. S., on the Relations between Spiritualism and Science," by R. M. N.; and "The Hereditary Transmissin of Stature to Female Descendants in Horses."

We find the reputation of the American Journal of Science well sustained by the July number. Some of the papers are: "Contributions to Meteorology" by Elias Loomis (with plate); "Cause of Irregularities in the action of Galvanic Batteries;" by Hays & Trowbridge; "Sensitive of the eye to Colors of a Low Degree of Saturation," etc.

The July number of "The Observatory, a Monthly Review of Astronomy," (London), sustains the past reputation of the Magazine. Among the notable articles it contains, may be mentioned "Photometric Observations of Ceres, Pallas and Vesta," "Harvard College Observatory," and "On the Defining Power of Telescopes." The latter is by Prof. N. E. Green, and well worth a perusal by those interested in telescopy.

The American Monthly Microscopical Journal presents in its July number, the usual choice and timely contents. Among other articles are the following: "Opercularia Constricta, N. S. P., (Illustrated)." "The Microscopical Discrimination of Blood." and "Staining Tissues in Microscopy."

The Journal of Comparative Medicine and Surgery (Quarterly) for July contains the following among other papers: "Indigestion in the Horse," "Bacteria Culture" and "The History of Tuberculosis."

In the July number of the Journal of the Franklin Institute, there is no lack of food for the intellect. "Mill Architecture," "Isochromatic Photography" and "Glimpses of the International Electrical Exhibition, are some of the best papers.

The American Meteorologist for July contains some very interesting reading. Among other paper we call attention to "Climate of Santa Fe" and "Weather Changes of long Period." The first by M. W. Harrington, the other by H. H. Clayton.

Other periodicals received are The Canadian Science Monthly for July; The Journal of Mycology, for July; The Gardiners Monthly and Horticulturist, for July; The Agassiz Association Journal, for July; The Practical Photographer, for July; The Library Journal, for July; The Co-operative Index to Periodicals (Quarterly), for May and June; Knowledge (R. A. Proctor, London), for June; The California Architect for July; La Moniteur du Commerce, for July; The Dial, a Monthly Journal of Current Literature, for July; The Auk, a Quarterly Journal of Ornithology, for July; The American Inventor, for July; The Manufacturer and Builder, for July; Scandinavia, for July; Mind in Nature, for July; The Woman's Magazine, for July; The Electrician and Electrical Engineer, for July; The Progressive Age, for July; Science (Weekly), for July; Le Technologiste, for June; The Virginias, for June; Clay, for June, &c.

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PROSPECTUS

OF THE

KANSAS CITY REVIEW.

Kansas City, Mo., August 5th, 1885.

It is the purpose of the undersigned to continue the publication of the Kansas City Review of Science and Industry under the name of the KANSAS CITY REVIEW. It must not be supposed that we contemplate any material change in the character of the REVIEW by thus curtailing its name—on the contrary it will continue in the course pursued by its founder—but several new features will be added to those heretofore belonging to it, which experience seems to dictate will be of interest and utility to its readers. Among the new features contemplated will be a department devoted to Essays and Reviews, and space will be set apart for Correspondence and Queries. Other additions may be made in the future if necessary to give the REVIEW a wider and more popular acceptation.

It is hoped that the former patronage extended to the REVIEW will not suffer by reason of the interval between the last and the present numbers. In making the proper arrangements for continuing its publication under new auspices an interval of suspension was unavoidable. We feel confident that, under the present management, the people of Kansas City and vicinity will find the REVIEW a worthy object for encouragement and patronage. Our present subscription list is quite large and includes the most thoughtful, enlightened and progressive inhabitants of Missouri, Kansas, Colorado and other neighboring States; hence the REVIEW will not only be a valuable medium of communication for those who have scientific or other discoveries and theories to advance, but also desirable as an advertising medium. It is the policy of the present management to present the claims of advertisers in a conspicuous and attractive manner and thus place the REVIEW abreast of more pretentious periodicals in this respect.

In all that goes to make up a first class magazine the KANSAS CITY REVIEW will not be found wanting. It will be printed on calendered paper, made especially for the purpose, in clear, legible type, and each number will contain from eighty to one hundred pages. Its contributors will include some of the best and most famous writers of this country and Europe, and its Departments for Book Notices and Reviews will be found always fresh and interesting.

The price of subscription will continue at $2.50 per annum. But for Volume IX, which will contain only the August, September, October, November and December numbers the subscription price will be only $1.00. Patrons will only be asked to subscribe till January first at present.

T. S. CASE, M. D., }
WARREN WATSON, } Editors.

JAS. E. PAYNE, Publisher.

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SEPTEMBER, 1885.

THEO. S. CASE, M. D.,
WARREN WATSON, } EDITORS.

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THE BEGINNINGS OF LANGUAGE.*

The art of conveying conceptions, or impressions, from one consciousness to another, by vocal utterances, has its origin so far removed from the possibility of exact investigation that students cannot aspire to settle definitely the disputes that arise in every examination of the subject. From one point of view the genesis of spoken language was a miracle; and if this be the correct opinion there is little matter left for controversy, which would become, for the most part, mere logomachy. But if we examine the matter from a naturalistic standpoint many interesting questions and lines of research present themselves; and, as the discussion of the subject can be more easily approached on this side, it may be conceded, for the time, that vocal speech, like other arts, arose by slow, but progressive, steps from almost imperceptible beginnings. In fact this art is not confined to the human family. We know that many animals can convey by means of vocal sounds, well defined ideas which are recognized and responded to by their fellows. Who has not noticed the numerous modulations and inflections in the voice of a favorite dog? And who could fail to distinguish the bark of welcome from the bark of defiance? Brehm, the German traveler, says: "It cannot be denied that the voice * * * * of the Chimpanzee is a formal language. All the sounds are fully accentuated, and the observer soon understands the meaning of the different modulations, while children, playing with the animal, catch at once the sense of its utterances." Of course this observer did the songs of birds must be learned from contact with other birds, for, while the tendency to sing may exist, "the particular notes, or succession of notes," can only be acquired by imitation. The Tyrolese have taught their canary birds "a peculiar song and this they now transmit to their offspring." The bark of domestic dogs is an acquirement—wild dogs do not bark and by some it is supposed to be an attempt to imitate the human voice. Indeed it may be said that the progress of spoken language in animals is only limited by the form of the vocal apparatus and the functional development of the brain.

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*Read before the Query Club.

The relation between the cerebral centers and the mechanism of vocal speech is difficult to examine in its early stages. The infinitely complex arrangements of vocal chords, lips, teeth, palate, tongue and the multi-

that portions of the cerebral cortex bear a direct relation to speech; and that as one and another of these portions are removed, the power of vocal utterance is more and more limited, and finally destroyed. I might refer, also, to numerous cases of aphasia, accompanied by lesions in the cortical substance; but enough has been said to show that physiological development was an important factor in the beginnings of language.

Mr. Darwin has suggested that the first step in the formation of language might have been the imitation, by some anthropomorphous animal, of the "growl of a beast of prey" as a warning to his mates of the "nature of the expected danger." This suggestion is in line with what has been called the "bow-wow theory" of linguistic origins; a theory, however, which is growing in favor with scholars, notwithstanding the ridicule it met at first from eminent philologists. According to the views entertained by this school, "language owes its origin to the imitation and modification of various natural sounds, the voices of other animals and man's instinctive cries, aided by signs and gestures." How from such low origins, the wonderful instrument of vocal speech arose to its present perfection and utility can be explained on the physiological ground above referred to and by the tendency toward change and novelty, which characterizes the human species, as well as by the ever increasing circle of acts, events, and things which civilization brings into relation with man. There is no question but that words were invented before connected speech, and that gestures, at first, formed an important element in the communication of emotions, wants, or impressions, from man to man. In fact, it would seem that gestures constituted the primeval verbs and adverbs, and that facial expression played a great part in limiting spoken words. Even now, though we have a "well of English undefiled," to draw from, we eke out our meaning by a thousand movements of the head, limbs, body and facial muscles, or, lacking that power, seem dull and cold to listeners. It is said that pantomime was carried to such perfection amongst the ancients that, not only farces and comedies, but even tragedies, were acted without a spoken word; and this art became so perfect in Rome that such dramas were presented to audiences drawn from all parts of the Empire, composed of Romans, Greeks, Gauls, Germans, Persians, Parthians, Egyptians, Numidians and Jews, who could all follow the incidents of the plot with equal facility. It will be observed that gesture language does not take cognizance of verbal differences. It is obvious that the eye, the hand, the mouth, perform similar services for all races; hence a symbolism, drawn from such objects, and used to transmit ideas between different individuals, forms a universal language which is not concerned with the variations of spoken language. Yet, none the less, it will strongly impress a thoughtful student that spoken language must, *ex necessitate*, have been affected by gesture language very extensively, and must bear imbedded in its strata the fossils which, once discovered, would make the difficulties of the subject less insurmountable. Besides the learned and exhaustive work of Mr. Gatchett there are few books extant that can furnish any assistance to delvers in this field; but there is no doubt that the subject will continue to attract the curiosity of scholars till its difficulties are thoroughly explained.

It goes without saying that writing has nothing to do with the *formation* of language; though it has, undoubtedly, been instrumental in its modification and extension. Even the rudest savages possess a language of spoken words, however meagre; and it must be borne in mind, before despising the trivial vocabularies of savages, that, even in this enlightened nation, there are few day laborers who can repeat three hundred words of their mother-tongue—a tongue which boasts a dictionary of one hundred and fourteen thousand words. "This fact," says Prof. Max Mueller, "simplifies immensely the problem of language." His view is fully borne out by recent researches. It has been discovered that every language is founded upon certain root words, few in number and hard to distinguish, on account of their great antiquity and the consequent changes in their pronunciation. Some of these roots, however, have an easily discernible origin. The names of animals are frequently derived from their cries; as cuckoo, bobolink, hoopoo, etc. Such words as bang, crack, purr, whiz, hum, etc., seem to be attempts to characterize the sounds they represent. Thus, also, of the inarticulate sounds of the human voice; such as those expressed by the terms moan, groan, sigh, cough, sneeze, yawn, halloo, etc.; those of animals simulated by cackle, gobble, twitter, mew, yelp, roar, croak, etc.; words expressing the collision of hard bodies, rap, tap, snap, slap, crack, smack, whack, pat, batter, beat, etc.; the sense impressions expressed by clash, smash, crash, splash, clang, ring, bump, thump, boom, hum, hiss, rustle, whistle, whisper, murmur, whir, puff, fly, flit, flow, flutter, patter, crackle, bubble, rush, etc. From characteristic, but inarticulate expressions of the emotions we get a number of words like woe, ache, etc.; from O! Ah! Ugly, hugh, huffy, from the guttural ugh! etc., etc. It is true such words form but a small part of the vocabulary of a language and, admitting that in-so-far as we detect such probabilities of origin we can trace a word to its original root, yet there are large classes of ideas which are seemingly not expressible by sounds either directly or by analogy. But even here the difficulties are not insuperable. Take the word "heart," for instance, whose etymology discloses that it is the descendant of a root word "hrad," which attempted to reproduce the throbbing sound of the heart-beat; and "foot," from the root "pad," evidently an attempt to give the sound of a foot-fall; and "daughter," from the root "dhugh," to milk, (the milker) probably onomatopoetic for the sound made by the gushing milk in the pail. These are mere guesses of course, and it is quite likely they are incorrect, but the point can be illustrated by them just as well as if they were entirely apposite. Suppose the primitive man wished to describe some carnivorous animal: the most salient characteristic to him would be the savage growl, and this, imitated, might become the name of the beast. But the matter would not end there. From this newly coined substantive adjectives, adverbs and verbs would be formed *ad libitum*. Our noun "dog" has given us, as an example, the adjectives "dogged" and "doggedness," the adverb, "doggedly" and the verb "to dog"—all of them far removed from the root-word, which, probably, was merely an attempt to reproduce the snarl of the animal named.

Many such examples could be given but, in the end, they would only emphasize the point without strengthening it.

These instances give rise, however, to another reflection. It is apparent from them that the real thing apprehended by the primitive man most clearly was the qualities or characteristics of surrounding objects. It is this fact which accounts for the universality and homogeneity of sign language before alluded to, and may account for the striking similarity of occasional words among widely scattered nations. The sound of the wind among the trees, the patter of rain-drops, the surge of ocean billows, the ripple of flowing water as well as the cries of birds and animals, would be phonetically similar whether reproduced by the human voice in China or Peru. The deduction is too obvious to dwell upon.

It has been contended that the steps by which an infant advances to a knowledge of language, reproduce the stages which, respectively, presented themselves to primitive man. This contention is correct in one sense at least, for whatever might have been the actual process, there is little doubt that the language of each race furnishes many evidences of a growth from the simple to the complex. An infant, in its first instinctive efforts to use its voice, gives utterance to a meaningless gabble which cannot be considered as even incipient speech. It is not an attempt to express its wants and bears no more resemblance to language than the sound of the wind in an Æolian harp does to true music. Both come from the insensate side of nature. But there is a difference between them. The wind might breathe upon the strings of the harp forever without producing any thing better than the wild chords its first zephyr had aroused; while the intelligence of the child observing the effect of the sounds automatically produced by its vocal apparatus, would strive to reproduce them consciously and would thus form the nebulæ of language. The intellect of an infant, like that of the lower races of man, though in an embryonic state, is quick to respond to outside impressions. When the discovery is made that its utterances are responded to by certain familiar objects which are always in its vicinity, the child begins to associate these objects with the sounds it makes. For instance, one of the first sounds the voice of a child produces is *ba* or *pa*, *da* or *ta* or *ma*, and the result is, that among widely separated people in Africa, Asia, Europe, North and South America, Australia, New Zealand, and the islands of the Pacific, the pa-rental relations are expressed by the above sounds or their modifications or duplications. These primeval germs of language, seemingly so insignificant are really of vast importance, for it is the first steps always which are the most difficult. Having discovered the efficacy of nomenclature the infantile mind is not slow to extend its vocabulary. The record kept by Taine of the linguistic progress of a child is a curious confirmation of this fact.

It is thus that an infant in its first instinctive efforts at vocal speech gives names to its parents and attendants and the objects of its wants. Along with these substantive words would come ideas of quality, of attributes which characterize these various objects. Food is good or bad, nurse is cross or kind, medicine is nasty, etc. Thus it is that the child next gathers a small list of adjectives to help out the few substantives and pronominals at command. Then there enters its dim consciousness another, and a very important impression; that is, that these objects, so named, exist independently of itself and are capable of performing certain actions. This step in mental progress furnishes it with pseud-conceptions which need characterization, verbal identification. This, with the prior experience of the child, is easily accomplished and he is now in possession of the skeleton of language. The next step is to put it together. To do this properly there are other kinds of words to be acquired—viz: prepositions, adverbs, conjunctions, etc. These are not such easy conquests as the others, because, standing by themselves, they have no meaning whatever, and the child can only grasp their office by observing their relation to other words. It is true a sentence can be constructed without these meaningless words: "dog runs," or "black dog runs," are sentences which convey well defined ideas, and both could be easily constructed by the child. But the sentence "black dog runs fast and barks fiercely," is too complex, contains too many meaningless words, to be so readily apprehended or reproduced; yet adverbs are very easily acquired in comparison with prepositions. Indeed many fairly educated men make frequent mistakes in the use of these vexatious little words which are so utterly barren of meaning in themselves, and yet are so potent in fixing the meaning of other words.

That by some such gradational development a child acquires the art of vocal speech will not be questioned: and there is little doubt that primitive man acquired his stock of words and put them together in much the same way.

There is this difference, however, to be noted: the words which the child learns are, for the most part, taught to it by rote; while primitive man was forced to coin the words out of which his sentences were constructed. How, then, did these meaningless words first come into existence?

In carrying out the linguistic development of a child we have outrun the development of primitive speech. We have talked of substantives, pronouns, verbs, etc., while in truth there is every reason to believe that in the earliest language each word might fill the office of the various parts of speech interchangeably. In the Chinese language such is the case even now, and it is true also of several other languages. In this stage of development all the words of a language must have had well defined meanings, and only became prepositions, adverbs, etc., from the relation in which they stood to other words. This is not all speculation. We have traces even in so old a speech as our own of the growth of meaningless from significative words. Thus our preposition "from," originated in a primitive Aryan verb, meaning, "to go through," or cross, while the conjunction "and," came to us as an int. verb, (and was used as such by Shakespeare,) and "the" came into our speech as a relative pronoun—in fact the pronoun for all genders which we now lack, and need so much. Many instances of this kind could be adduced; but by far the larger part of the meaningless words in our language baffle the acutest enquiry into their origin. From the few known derivations, however, we are enabled to guess the mode in which many words of this kind originated.

It is stated above that language has been traced back to comparatively few root-forms; and when we are told further that these root forms are all monosyllabic we can see that the primitive speech of man was composed of words of one syllable like the language of the Chinese and of the Otomi of Mexico. The process of building up polysyllabic words came about by agglutination, which is characteristic of all rude languages. In fact it was this process of agglutination, together with certain vowel changes, which produced the earliest inflections of substantives and verbs. The root-form was usually a consonantal sound or a combination of consonantal sounds. A vowel breathing was given to this, and different shades of meaning were expressed by changes in this breathing.

It was by some such process as above pointed out that man first equipped himself with those sounds which formed the fixed roots of words expressing objects, conditions, qualities, actions, and derived from them the elaborate material of cultivated speech. Many of such derivatives are the meaningless words before alluded to, which perform such an important office in determining the relation of other words, and which appear in our inflectional forms in an atrophied state; and these inflectional forms now invite our enquiry as to their origin and growth.

It is obvious that the essential idea in the substantive is the object named; in the verb the action verbally characterized. But primitive man would soon find the bare root-words too inelastic to serve his purpose. The relation of different objects to each other, the different modes and successions of action and the varying persons of the actors, would demand recognition and verbal discrimination. If all these different shades of meaning had required the invention of distinct words to express them, language would have become too cumbrous an instrument for the every day uses of man; and there was no tendency in this direction. The natural process of evolution, while it advances from the simple to the complex, does not create or destroy; it simply differentiates and combines. Language was no exception to this law. When the earliest man perceived an object or an event in novel relations, he did not coin a new word to express the phenomena, but took the word already known and added to it the words expressive of the relation. For instance, the phrase "beside the tree" expresses a complex idea in which the element "tree" is subordinate to something which is pointed out by its vicinity. We place the inflectional word before the noun, but the natural way, as shown by the comparison of all languages, is to make it come after the word to be affected. Thus our primitive friend would say "tree beside;" using, however, instead of our preposition, words which to him gave a notion of the relation he wished to express, and which gradually assumed the prepositional form only to lose it again in a case ending. "Beside," for example, is composed of an archaic word "be," meaning *round*, and "side," which originally meant the *edge* or *border* of a thing. Thus "tree beside" would have, at first, a meaning in all its components as above stated.

This is indubitably the mode in which our inflections originated; and the rise of this feature in linguistic growth heralded the approach of the grammar stage of language. It is apparent that so long as speech remains monosyllabic, that is so long as every compound word can be split up into other words, each with a distinct office, rules of grammar are of no utility whatever. But a time comes finally when neither the root or its added elements have distinct meanings; when all of them, taken together as one word, are indispensable to perform the required function. It is at this time that grammatical science becomes necessary and possible. Most all languages are in this condition of growth, at least in the Indo-Germanic, or Aryan family. For, while we have been dissecting modern words to find their atrophied components, it must be borne in mind that much of this is guess work; and it is only the refinement of philology which distinguishes the separate words of the ancient expression among the debris that remains after centuries of use and decay.

We have now reached a position which is properly the last stage in the growth of language; but there is a final principle which calls for a few remarks. After speech has attained the inflectional form a peculiar change tends to come about. To illustrate, take the verb "to be." The earliest form of the *p. t.*, *ind.*, *1st pers.*, is the sanscrit *asmi;* and the consonantal sound—*m*—in that verb, whatever primitive word it may represent, is perceptible in our "am." In the sanscrit word, *as* is the verb, while *mi* is merely a relative pronoun; and thus our verb, singularly enough, has eliminated all phonic fragments of the original verb and retains a single sound only of the pronoun. It follows that when we say "I am," we are simply uttering, according to original meanings, "I, I."

It is hardly necessary to remark that almost all of the stages of growth in primitive languages still occur, even in our finished form of speech, for large bodies of words. And we can easily study their development by condescending to notice the changes, by way of idiom, slang, foreign words, corruptions and provincialisms, which daily occur in colloquial speech. But enough has been said to serve the purpose for which this paper was prepared.

EARLY STAGES IN THE EARTH'S GROWTH.

There are many things in the scientific world that are interesting objects of study and subjects for thought. The most important discoveries in science are known to every well informed person. Many of these discoveries are known like house-hold words. The scientist with his instruments, the merchant in his library, the minister from the pulpit, the farmer at his table, and the woodsman at his cabin door, all discuss momentous subjects, and each astonishes his hearers in the same ratio as their ignorance. The cracker-barrel of the corner grocery is not without its oracle, who settles the questions of Science and Theology before a gaping audience.

Objects of which we are conversant never lose their interest; no matter how many times they are presented before us there are always new points to study, whether it be a trilobite or a horse-shoe crab, a mastodon or the armadillo. We, as students, never tire of old, and are ever anxious to learn new, truths. The geologist's hammer rings just as cheerily as ever, the palæontologist is never weary, and the physicist is persistently trying to forge the one single link which will make his chain complete.

The moon being the nearest orb, (221,590 miles from the earth) let us visit it mentally, and from its surface watch the formation of the earth from its nebulous mass. The *nebular hypothesis* is known to all, and those of us who accept the theory do so owing to its plausibility. Nebulæ is a name that was given to indistinct patches of light in the starry fields. It has been shown that some of these are (1) clusters of stars, or (2) masses of luminous gas or vapor, thereby vindicating Herschel and Laplace.

We are now looking from our eyrie in the moon, upon a mass of gaseous or vaporous nebulæ. This gradually becomes smaller and denser, loses some of its luminosity and begins to borrow splendor from surrounding celestial bodies, assumes a globular form many thousand times larger than the present size of the earth, forms a nucleus of solid matter enveloped by a dark curtain of clouds and chemical vapors. Circumstances prevent our physical gaze from penetrating beneath this curtain, but mentality comes to our aid and we part the clouds, thereby enabling us to see a molten substance which we will call granite. We observe that the clouds, constantly whirled about by tempests, precipitate a primeval rain upon the liquid granite only to be thrown back in masses of vapor. This produces other meteorological disturbances. Storm after storm sweeps across the sphere, tornadoes, cyclones, simoons and hurricanes are striving for mastery over the new born earth, and, neither one gaining supremacy, they all maintain control of some portions of the earth during its life. Every torrent of rain upon the granite, as we can see, chills and disintegrates until it is sufficiently cool to retain metals, and other mineral substances and at length a certain amount of water; thus we have oceans, lakes and rivers composed of the element necessary for sustaining the first life.

In this nebulous mass surrounding our infant world are the elements to produce and maintain life. In it is the germ of wheat, the protoplasm of animal life, the bioplasm of man. This nebulous material contains the dreaded fire-damp and the invigorating oxygen. Within this luminous vapor are the elements which millions of years hence will produce crime and benevolence, sorrow and joy, gentleness, anger, bitterness and sweetness; in fact every potency which supports or destroys life, or makes, or mars man's destiny, is contained in this nebulous mass. We now notice through a rift in the clouds that the waters are rushing along, and torrents of rain are falling, both producing erosion of the igneous rocks. The unequal cooling, denudation and internal disturbances have formed hills, vales and mountains. By the heat of the scarcely cooled surface, coupled with the sun's rays, water is drawn into clouds and precipitated again and again in tempestuous masses, cutting, tearing and washing the primeval rock which is carried along to be deposited in whirlpools and ponds and lagoons, thus making the first stratified rock, called Laurentian in North America, and Pre-Cambrian in Europe. The waters are now less turbulent, and, if we could make an examination, by the aid of a powerful magnifier, animalculæ could be seen, composed of minute calcareous shells chambered or not, containing gelatinous matter. The waters are teeming with *foraminfera* which are termed eozoon. These animals constitute the first life of our world. The waters need not necessarily be cool, for some of the lowest orders of infusorial life can live in warm waters. If extreme evolutionists are correct all future life of the earth sprung from these eozoon, or we might say vitalized mud. These animals, upon their death, would precipitate their shells, thereby making limestone. All the limestone of the earth is made from the shells of animals. The eozoon were so numerous as to produce Laurentian limestone 20,000 feet thick. Lead, copper, baryta, graphite and mica make their appearance in this the second period.

The clouds are drifting lazily away from our field of vision, and we can see the evolution of the third period. The earth is rapidly cooling, the terrestrial disturbances are lessening, storms are more regular, order is taking place of chaos. This we will designate as the Huronian in North America, and the Cambrian in Europe. Lagoons, lakes, rivers and ponds are frequent. The earth is no longer rent with gigantic volcanoes and terrific earthquakes. In the waters swim annelids, or worms, and the beautiful trilobite crawls over the mud of lagoons around lake Huron. The trilobites feed upon worms, and if we could see them closely, it would be noticed that their eyes are novel in construction, like unto no other animal. The eye is raised above the body in the form of a frustrum of a cone, open upon the side nearest to the same condition of the other eye. This cone is composed of facets the same as that of the common house-fly (which has about 4,000 facets or eyes.) This fact teaches us that the phenomena of light and vision are the same now as they will be when man appears, also that our Silurian waters are sufficiently clear to transmit light. As companions to the lobster-like trilobite with its three lobes, we notice mollusks or shell fish and the industrious coral insect, fabricating its chain coral which will not be found in any period except the Silurian now forming. The one inch trilobite of the upper Cambrian has now attained a length of twenty inches; four hundred species flourish in our Silurian waters. In the upper Silurian we see a companion for the trilobite. It is darting hither and yon; it glistens in the sun-light; it is the first fish; we will call it *placoid*, from its irregular plates with spines, a low order of animal with a fierce nature. The earth is now cool upon its surface. As fish cannot live in hot water the earth's surface must have become measurably cool at this time. The climate is milder, storms are periodical, the flowing waters are muddy, the winds are blowing sand and pulverized rock in all directions. Mollusks, or clams, snails and cuttle-fish, trilobites and fishes, are dying; their bodies are thrown upon the shore, and in a dessicated state are blown to mix with the sand and pulverized rock, thus laying the foundation for soil for producing vegetation; even now we can notice seaweeds, and on the shore where the mud is the richest are the first land plants. These plants will indicate hereafter a new formation called the old red sandstone. We cannot see many aquatic animals near the shores, owing to the red oxide of iron in the water, that gives color to the old red sandstone, which, like all other rocks, except granitic and volcanic, is formed by sediments precipitated from the water. The luxuriant vegetation, just commencing, shows a great amount of carbonic-acid gas in the atmosphere. The flora is now increasing; it is spreading over all dry land; the waters are wearing away the rock to make new formations; snails and clams are making the deposits rich with fauna; and the octopus, or cuttle-fish, is searching for prey. Step by step the earth is being prepared for higher forms of life.

We can see through open clouds the formation of the Devonian period; and, as the earth rolls so as to show the American continent, we [illegible]strial plants, the first step towards terrestrial life. Snails, trilobites and clams are continuing to flourish, and by living and dying, assist to make new strata that are rich in fauna. Although this is the age of fishes, land plants are numerous, ferns, *Lycopodia*, or ground pines, four or five feet high, jointed rushes, Calamites, or tree rushes, twenty to eighty feet in height, and many flowering plants; all producing a flora of one hundred and eighteen species. We also see the first American fish, called the Ganoid, from being covered with bony plates, sometimes entirely encased. The character of these indicates a struggle for existence in the seas, while on land evrything is comparatively peaceful.

Where land, water, rocks, seaweed and a few trees were to be seen, we now notice that a luxuriant vegetation is springing up. Vast tropical forests appear, not only at the equator but far north. Most of the whole dry surface is covered with ferns, bushy shrubs, tall coniferous trees as well as those bearing nuts. As carbonic acid gas is to the plant what oxygen is to the animal, we know that the atmosphere around the earth is surcharged with carbonic acid gas. The vegetation flourishes and takes from the atmosphere what would prevent animals from living. This is another step towards preparing the earth for the highest type of life, another product from the nebulous matter. We are now witnessing the formation of coal measures, or the carboniferous period.

Immense rhizodonts, or crocodiles, make their appearance for the first time; they feed upon fish and crustacea. The American nautilus is crawling laboriously, spiders, scorpions and land snails are creeping about, and the crab wades around, and over, beds of clams. While the struggle for existence is just commencing, let us notice the formation of coal. There we see luxuriant vegetation, yonder an impenetrable forest, consisting of *stimaria* pithy without branches, reed-like plants; *lycopods*, or fern-like mosses; *arançariles*, or pines, fifty feet high; in fact we can count five hundred species of plants which produce an arborescent vegetation like unto which we shall never see again. Dense clouds obscure our vision, and while they are clearing up let us indulge in speculation as to the manner of coal formation, which may be in one of three ways: (1) Upheaval by internal disturbances, throwing down the flora, which is covered with sediment and earth, and carbonized by time. (2) In the forests are large bodies of water. Upon these inland seas twigs, leaves, and decomposed trees fall and undergo disintegration, thereby producing an oleaginous substance. Under intense sun-rays this substance loses its volatile matter, leaving a thick, dark, gummy mass; additions are made to it, until it sinks to the bottom, carrying with it perfect wood, leaves and ferns. The whole is covered with sediment which in time becomes a layer of rock. This process is continued until the coal seams are completed. (3) The vegetation grows upon clay. Roots permeate the clay, mingling with shells and marine remains, and this compost is gradually submerged until the foliage is under the water, and from the want of proper nourishment dies. Another layer of clay is formed over the sunken vegetation, upon which grows a new foliage for another coal seam, and so on until the 2,000 feet, or more, of the coal measures are completed. As the cloud passes from between us and the earth, and the atmosphere clears a little, it seems as if the last mode of coal formation is the right one, yet we cannot be positive. We have seen enough to show that vast forests cover the earth—that is the northern part of it—the southern is still under water.

As all mists and clouds pass away, we know we are still viewing the coal measures, the beginning of the paradise of the palæontologists, the elysian fields of the evolutionists. With a piercing eye we can see the first reptiles; the fishes which we have seen so long still flourish, but the trilobites have disappeared. The lagoons and small lakes containing them we have seen filled up, burying their bodies, which the geologist's hammer, ages hence, will unearth to the delight of the fossil hunter. The placoid fish has left its spines, cranial bones and plates in mud, secure for study millions of years from now. The cuttle-fish, clams and snails still add interest to the carboniferous waters. The arborescent vegetation has absorbed the superfluous carbonic acid gas, leaving nitrogen and oxygin for terrestrial respiration. Land is rising and waters subsiding. Limestone, shale, clay. sandstones and slates have been formed by deposits from water; these by grinding and erosion have again become sediment, which being mixed with dead mollusks, trilobites, fishes and vegetable matter, compose a soil capable of producing food for a higher order of life. Ere long the bird-songs will welcome, with music and brilliant plumage, the mammals, and a new era of the earth's existence.

A dense cloud passes between the earth and our position upon the moon, and so ends the palæozoic, or primary stage of the earth. Intervening clouds have caused us to miss many an interesting stage of growth; yet we have certainly learned some things by studying the earth's growth from infancy, with its swaddling clothes of nebulous matter, to its second period of existence.

LIFE IN DEATH.

[From Knowledge.]

No one can have read extensively in any species of literature without coming across passages or occurrences which must, at first sight, at least, appear to him to be incredible, if not absolutely impossible. Nor is this experience peculiar to works of fiction, in which it would, of course, be more excusable than elsewhere; it obtains also in the graver productions of the literary pen, and exaggeration, instead of diminution is the characteristic of the genus *irritabile vatum* everywhere. Passing by, therefore, as being in a measure privileged, the "words that breathe, and the thoughts that burn" of the poet, we will descend into the lower plain of the historian, and endeavor to show that, so far as certain *escaper* or occurrences narrated by the latter are concerned, "truth is sometimes stranger than fiction."

Without stopping to discuss the differences that are produced in wounds inflicted by modern weapons and those that are due to the appliances used in former times, we may glance at the constitutional capacities for endurance, etc., that peculiarities of soil, climate and food impress upon certain races, and so avoid technicalities of all kinds. It is well known that man in the savage or semi-civilized condition has those organs of sight, hearing, touch and the like, with which he has to contend for his support with the beasts that perish, more highly or sensitively developed than his brother of the city or the plains; and as an illustration of this, we may point to the fact, noticed in all the papers, that the Maories who lately visited this country always saw land before any of their fellow passengers. The savage man, *pur sang*, can sustain with impunity an amount of exposure and suffering that would certainly prove fatal to his more civilized brother, and the insensibility with which the American Indians, for instance, endure initiatory and other tribal tortures is simply astounding. A similar measure of imperturbable indifference to pain, and even death, has been noticed in Oriental countries, and all our doctors in India testify to the rapidity and sang-froid with which their patients in that country bear and recover from the effects of grave surgical operations, and other like injuries. But this phase of the question is generally acknowledged; so that we need not dwell further upon it here, and one has only to examine the calf muscles of the *danseuse* or horse jockey, or the biceps of the blacksmith, to find that some of their muscles, as well, perhaps, as of their faculties, are developed at the expense of others.

That doughty deeds of personal daring and adventure were thought more of in the past than they are at present, may be at once admitted, and those hand-to-hand encounters we hear so much of in the pages of Gibbon and other writers are now rarely witnessed. Krupp guns and Martini-Henry rifles have so entirely revolutionized the art of war as to throw mere physical strength into the back ground, and place men, in the aggregate, on a level. Moreover, the atmosphere of the East has never been favourable to the ennunciation of truth for the truth's sake, and it was the interest as well as the desire of the crusading writers to exaggerate the performances of their leaders and masters.

Nor need we go back to the crusades for examples in point. They are to be found much nearer home, and deeds are ascribed, by serious writers, to some of our heroes in the East which would do no discredit to the prowess of a Cœur-de-Lion or even a Saladin. Thus, describing some of the hand-to-hand encounters that took place at Meeanee, Sir Charles Napier is represented by his brother as saying ("The conquest of Scinde," Part II., p. 320) that "Fitzgerald's sword on its descent went shear through shield and turban and skull, down to the teeth," and Captain Creichton is said to have assured Swift (Works, Nimmo's Ed., p. 531) that "Fowler (a covenanter) aimed a blow at me, but I warded it off, and with a back stroke cut the upper part of his skull clean off from the nose upward." Dean Millman caps this narrative with an account he gives of the strength and skill of one Ali, who, it appears ("The History of the Jews," Vol. II., p. 96), "Clove the skull of Marhab, the great champion of the Jews (of Khaibor), through his buckler, two turbans, and a diamond which he wore in his helmet, till the sword stuck between his jaws," and whether the weapons used on these occasions were of Damascus or Toledo manufacture, we are unable to say. All we know is, that no such results follow from sabre blows or cuts in these, our degenerate days.

So keen is the instinct of self preservation, or the love of revenge, that men—aye, and women too—have been known to achieve results under their influence which they would scarcely think of at any other time, or under any other impulse; and it is well-known that the excitement of battle and the hope of conquest have often enabled a handful of men to hold their own against overwhelming odds, and induced individuals amongst them to undertake enterprises that would in any other situation appear impossible. It is doubtless, to these feelings that we owe some of the displays noted within; and the greater strength and ferocity of mountaineers is universally acknowledged. The two following stories will enforce and illustrate these points:—

Describing an encounter that took place in the reign of Robert III., between a body of Highlanders and a party of Lowlanders, Mr. Tytler says ("The History of Scotland," Vol. I., pp. 93-4), that "Lindsay had pinned one of these mountaineers, a brawny and powerful man, to the earth; but although mortally wounded, and in the agonies of death, he writhed himself up by main strength, and with the weapon in his body, struck Lindsay a desperate blow with his sword, which cut him through the stirrup and steel-boot into the bone, after which his assailant instantly sunk down and expired." And General Napier mentions a very similar struggle between a soldier of the 22d Regiment and a Belooche swordsman. His account of it runs as follows (*ut supra*, Part I., p. 317): "A soldier, bounding forward, drove his bayonet into the breast of a Belooch. Instead of falling, however, the rugged warrior cast away his shield, and seizing the musket with his left hand, writhed his body forward on the bayonet, until he could avenge himself with one sweep of his sword." He adds that "a Belooch requires no second stroke," and that "both fell dead together." Very tragic, no doubt, but—farther deponent saith not.

We may quote the following from Scott, without in any way vouching for its probability in connection with this kind of mountain warfare, and leave the narrative to speak for itself. Describing the fierce and fatal struggle that took place in 1652 between Evan Cameron, of Lochiel, and an English officer of great strength, Sir Walter says ("Tales of a Grandfather," 1872, pp. 501-2) that "he (Lochiel) had a personal rencontre strongly characteristic of the ferocity of the times." Being singled out by the officer referred to, and as they were separated from the general strife, they fought in single combat for some time. Lochiel was dexterous enough to disarm the Englishman; but his gigantic adversary suddenly closed on him, and in the struggle both fell to the ground, the officer uppermost. He was in the act of grasping at his sword * * * * and was naturrally extending his neck * * * * when the highland chief, making a desperate effort, grasped his enemy by the collar, and snatching with his teeth at the bare and outstretched throat, he seized it as a wild cat might have done, and kept his hold so fast as to tear out the wind-pipe. The officer died in this singular manner. Lochiel was so far from disowning or being ashamed of this mode of defence that he was afterwards heard to say "it was the sweetest morsel he ever tasted."

Let us now turn to another phase of the question, and see how far that deviates from credibility, or accords with the experience of our common life. Dwelling, apparently with much complacency, on what he called the *Horendus Maximini interritus—alias* the painful death of the tyrant Maximinus—Lactantius says (*De Mortibus Persecutorum*):—"*Deinde post multus gravesque cruciatus, cum caput suum parietibus infligeret, exilierunt oculi ejus de caveis;*" and it is worth while asking whether anyone, sane or otherwise, can *per se* "dash out his own brains," or cause his own eyes to start or jump out of their sockets. Grave writers and "able editors," as Carlyle would call them, say the thing is possible, and we occasionally read of such performances in connection with police-cells, lunatic asylums, and the like. Thus the reverend author of a little book called "A Popular History of the Insurrection of 1798," after mentioning the dreadful sufferings that were endured by those who were subjected to the horrors of half hanging and the pitch cap in that year, says (p. 72,) that the victims of these pleasantries "dashed their brains out, in the madness of intolerable pain, against some neighboring wall, and thus put an end at once to their life and misery;" and the following occurs in Mr. O'Hagan's translation of the song of Rowland:"—

> He (R) saw the Saracen seize his sword,
> His eyes he ope'd and he spoke one word—
> * * * * * * * * * * *
> On the golden crest he smote him full,
> Shattering steel and bone and skull;
> FORTH FROM HIS HEAD HIS EYES HE BEAT,
> And cast him lifeless before his feet.

where we may safely leave him for the present.

If now, making every allowance for the poetic license assumed above, as well as for the juxtaposition of bone and skull, as if they were not here as elsewhere identical, we come to the beating out of the eyes and the dashing out of the brains, and ask ourselves if such things ever can or ever do happen, our answer will be that they probably never do. And yet stranger occurrences than even these have been gravely recorded by eminent historians. As an instance in point, we will quote the following from Milman. Mentioning the hard usage according to which the Syndic of the Jews was obliged to salute the mayor of Toulouse about the year 980, he says (*ut supra*, vol. ii., p.

146) that: "A stern, iron-handed magistrate struck the poor Syndic with such force as to scatter the brains of the unfortunate unbeliever"—and the hand that achieved this feat must, indeed, have been made of iron or other equally potent material; for unless this wretched Syndic was suffering from that very rare condition called *Mollities Ossium*, or that our magistrate had the strength of a Hercules, it is hard to conceive how such a result could follow from such a cause. And yet there is no affectation of poetic license or unreality here—the possibility of the thing is taken for granted, and there is no qualification such as even a query or note of admiration could supply. All we need, therefore, say in this connection here, is that where grave and learned writers like Milman put forward such statements without question, we ought not to be surprised when we find Scott and other romancists of his class investing their heroes with such attributes as are clearly beyond the reach of ordinary mortals.

It is, we believe, generally admitted that negroes have sometimes succeeded in committing suicide by swallowing their tongues; in other words, by doubling them back, and then drawing them into their throat, so as to stop the access of air to the lungs; and excision of the tongue is now a recognized surgical operation. But this operation to be successful or effective must be performed by a skilled surgeon or a trained executioner, and persons desirous of shuffling off the mortal coil never dream of trying to do so through the medium of this organ.

We have it, however, on the authority of Major Macpherson ("Memorials of Service in India," p. 67) that, "a Khond, captured by our troops in Baramootah, immediately tore out his tongue by the roots and died," probably of the hemorrhage which such attempt would necessarily entail. But it does not seem possible for anyone to tear out his own tongue with his own unaided hands, and in proof of this we have only to ask our readers to try and seize that somewhat slippery muscle themselves. If they will try they will probably find that they cannot introduce the hand into the mouth without producing sensations that would prove fatal to such an attempt; and, even supposing they had so far succeeded, how are they to drag—for that's the assumption—this very elastic piece of mechanism from its strong and deep-rooted attachments? The thing seems to be impossible, and we need not fear that our allusion to it will induce any future *felo-de-se* to prefer it to the easier and speedier alternatives of a jump over London bridge or a resort to the ever ready razor.

But we must hurry on to a close, and with this view restrict ourselves to one or more illustrative extracts of the character here contemplated. Describing the decisive battle that took place between the forces of Mahommed Shah Adily and those of the their locomotive powers; but soon becoming tired, they settle down upon some firm, stationary body. At once they prepare to take on a different form, becoming star-like in their appearance, with tentacles around the mouth, very much as leaves surround the center of a flower. After awhile each one of these ray-like parts pushes out extensions, which, in their turn, assume the shape of tiny stars, and establish their own existence by exhibiting an independent mouth. These polyps are all soft-bodied organisms, consisting of many varieties and having the organic functions of secreting carbonate of lime, which, with some other ingredients, as silica, and small portions of sand, compose the hard substance we call coral.

The body of the polyp consists of a cylindrical skin, with an inside sac, which is the stomach, and is furnished with little thread-like appendages with which it draws in its food, and it is between the outer skin and this sac or stomach that the limestone is secreted which forms the coral substances. It is a very common mistake to suppose that the coral producers are *laborers*. Nature has simply provided that in receiving their food the polyps should select from the ingredients of the sea-water that which is capable of being reduced by simple functional processes into coral, just as a plant selects and secretes from the earth that kind of nourishment which makes stems, leaves, and buds.

And so these beautiful creatures, these living sensitive animals moving at will and clad in the gay forms and bright colorings of a flower, are really the very *flowers* themselves; and what we call coral are not retreats into which the coral coloring comes and goes like a bird building her nest, but part and parcel of the creature itself; just as much so as are bones belonging to the human body, with this difference,—that in the case of the polyp, the stony part (representing the osseous structure of man) is all at the lower portion, while the upper part is soft and flexible, but in a healthy human body they are inseparably combined.

Naturalists have found out of late that the industry of these polyps does not consist in *building*, as hitherto supposed, but in *eating*, bringing about, as a result, a strong, stony structure, which must necessarily be slow in its formation. The denser the deposit the more valuable the coral. No one has seen just how these marvellous dwellings are built. It is a God-given power; and yet, what piles of stone are accumulated by these minute creatures,—as some one has said, "reared for eternity."

There are few natural objects more pleasing than a company of these corallets; for as the polyps rise above their cells and extend their fine, long tentacles,—resembling threads of pure white silk,—waving them to and fro like the radiated petals of a fairy-flower swayed by a gentle zephyr, or like a minute fan slightly concave at the edge, they present an exceedingly elegant appearance, and when quietly at rest they are said to be like "hoar frost on bed of moss."

But these fairy-like implements with which the coral polyp gathers in its food are not such innocent objects as they appear to the naked eye. If you could see them under a glass you would find on the tentacles a row of slight protuberances, one at the tip longer than the rest. This is the little creature's armory, for concealed within them are lasso-like filaments, called capsule threads, which they can throw out many times the length of the body. With these they capture their prey, paralyzing them by the fluid therein contained.

These are called *cridæ*, or thread capsules, because the small sheaths containing these slender threads are coiled, ready for use, and are darted out so rapidly when any victim comes within reach. The shock, however, is much less severe than that from the anemones, of which we have already spoken. The food of the polyp is always digested before the animal retires within its cell, or *calcle*.

In the Coralidæ the calcareous matter is firm and solid throughout, and all of a color, varying from crimson to rose-red. In the *corallium rubrum*, the red, or precious coral, the outer crust resembles the bark of a tree, and may be readily rolled off in this species. The true coral is the red axis, which it envelops, which is like a six-rayed star. Some shades are immensely valuable. The real *rose-pink* is much sought after, and will bring twenty-five times its own weight in gold, and is always sold by the *ounce* or *pennyweight*. It is found from thirty to a thousand feet below the surface of the sea.

Black coral, *Corallium nigrescens*, is still more scarce.

These massive forms of coral would never reach their vast proportions if it were not for nature's peculiar provisions: Life and death, occurring simultaneously, each aiding in one and the same object. Each mature polyp when fixed in its cell may be considered as resting upon the tomb of its ancestors, and when it dies *its* descendants will repeat the process over its remains, and its own body, within which its share of coral had been secreted, will be the base of a new living descendant. What marvels we find at every step of the way!

The variety of corals are very numerous and all extremely interesting and beautiful, but as this chapter is mainly designed to encourage further investigation, we shall not go on with any lengthened description.

The more we study the mysteries of the ocean the more we shall see that every living being, even to the most minute, is perfect in itself, and that the almost unknown body of the *stone* animal is as fearfully and wonderfully made, as that of man himself; while all, by the astounding wisdom of God, are constituted most favorably for the purposes they are designed to fill in the kingdom of nature, and are working together for

His good who formed them for His own especial service!

"Then study Nature with reverence high,
And she will give the key,
So shalt thou learn to comprehend
The 'Secrets of the Sea.' "

THE FRENCH ACADEMY IN ITS ORIGIN.*

"I undertake, since you request it, to write down what I know of the French academy,—a society about which many people talk, but which few people know as it ought to be known."

These are the words with which Pelisson, the original historian of that famous society, began his narrative. Notwithstanding the charm of his graceful style, the exact additions to the record which were made by the Abbe Olivet, and to the much more recent notes of Livet, to say nothing of Kerviler's readable bibliography, and Arsene Houssaye's witty and satirical criticism, the French academy remains to this day, as it was in 1653, when Pelisson's story was first anonymously published,—"a society about which many people talk, but which few people understand." Now and then some enthusiastic English or American writer proposes an English or an American reproduction, or a critic skilled in the poise of conflicting ideas sets forth the possibilities and the difficulties of organizing such an imperial agency, amid the decentralized institutions of Great Britain and the United States. Mathew Arnold concludes his famous essay on this subject by a sentence in which admiration is tempered with doubt. "An academy," he says, "quite like the French academy,—a sovereign organ of the highest literary opinion, a recognized authority in matters of intellectual tone and taste, we shall hardly have, and perhaps we ought not to wish to have it." We may venture to add, that, if London cannot have its literary court to exercise an acknowledged supremacy within a prescribed domain, New York and Washington must wait awhile before their political or financial power can originate a society which will be potent in the promotion of letters. Nevertheless, the growth of the French academy, and its influence upon the scientific, as well as the literary progress of France, are quite worth studying. It is the parent of the Institute of France, but it is the child of a modest coterie of literary people such as may be found in almost every cultivated town. Its extraordinary growth is due in no small degree to that innate love of symmetrical organization, or of good form, which the French exhibit in many phases of activity. It owes not a little to the power of the monarchy in the days of Louis XIV.

The French academy is always spoken of as founded in 1635, but several years before that date its nucleus was in existence. As early as

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*Science, for August.

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1629, a number of bright men in different parts of Paris, suffering from the impediments of a great city, and finding it inconvenient to pay visits without finding their acquaintances at home, determined to have a weekly meeting at a private house. They were men of letters, above the average ability, associated like our literary clubs, by the principle of good-fellow-ship, with the slightest possible regulations, and having at first no higher purpose than familiar and friendly conversation on business, news and literature, the interview ending with a promenade or a collation. If any of the company wrote something on which he wished genuine criticism, here was his opportunity to receive unguarded and honest comments. In later years the members of the academy looked back to this golden age of its infancy, when all that is bright and charming in literary society was enjoyed without noise, parade, or animosity. To avoid the intrusion of unwelcome fame, even the fact that there was such a club was for a long time not mentioned to those who were unconnected with it. But such could not long be hidden beneath a bushel. One by one, outsiders heard of that charming circle which was not engaged in the exchange of compliments and flattery, but which openly and boldly pointed out to the members their literary faults. All this Arcadian chapter is charmingly told by Pelisson, whose narrative we are following as others have so often done before. Boisrobert was then in high favor with Richelieu,—the one to whom the Cardinal's physician referred when he said, "Monseigneur, I can prescribe nothing more for you, but two drachms of Boisrobert after dinner." From this source the great minister of France heard of the brilliant coterie which met at the house of Couvart. The far-sighted sagacity of Richelieu perceived the possibility of giving public authority to these self-contained critics, and through Boisrobert he offered to become the protector of the club, and to give it the authority of *Lettres patentes*. His proposals were gladly accepted as honors from the crown, * and after due deliberation and formalities, the charter passed under the royal hand and seal in the month of January, 1635. This document is far more interesting at this late day than most such official papers. It abounds in lofty sentiments admirably expressed. It recognizes the conferences which have been held by the pre-existent assembly; it confirms and defines their purpose to be the promotion of eloquence, that is to say, of skill in the use of language; it bestows upon the infant society the name which has now become historic; it limits the membership to forty persons; and it confers upon the cheif and protector, Cardinal Richelieu, the authorization of officers, statutes and by-laws. Various other names had been proposed,—*l'Academie des beaux esprits*, *l'Academie de l'eloquence*, *l'Academie eminente*,—but finally *Academie francaise* was selected, because it was more modest and more appropriate.

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* The writer is here following Pelisson, who wrote at a time when the truth could not be spoken. Guizot says that the proposal was received with consternation, and that scarcely a member of the voluntary society did not testify displeasure. The argument of Chapelain that "they had to do with a man who willed in no half-hearted way whatever he willed, and who was not accustomed to meet resistance or suffer it with impunity," and that "he would consider it an insult to disregard his protection and visit his resentment upon each individual," shows quite explicitly the inducements that led to the acceptance of the proposal.—W. W.

The original statutes define in much detail the sphere of the academy, and its methods of procedure. Its purpose is thus stated in the twenty-fourth article. "The principal function of the academy will be to labor with all possible care and dilligence to give certain rules to our language, and to make it pure, eloquent and capable of treating the arts and the sciences." In subsequent paragraphs, provision is made for the distribution of the best French authors among the academicians who are to make a note of such words and phrases as suggest general rules of correct expression, the entire academy to be the judge of what is thus presented. The preparation of four works—a dictionary, a grammar, a rhetoric, and a poetry—is projected. At every regular meeting, one of the academicians, in his turn, is to present a discourse in prose, reading or reciting it as he chooses. He may select any theme, but must restrict himself in delivery to fifteen minutes, or at most, thirty minutes. The rest of the session is to be devoted to the examination of works which have been presented to the academy, or to the prosecution of the four great tasks already mentioned. Every discourse before the academy is to be referred to two censors, who shall report within a month their observations upon it, and the author, within the following month, shall submit to the commissioners the corrections which he may have made in accordance with their suggestions. Similar steps are to be taken in respect to other works submitted to the judgement of the academy. Brief rules are laid down to make the criticism truly effective. The commissioners or censors are not to keep copies of the papers they examine, nor of their observations upon them; faults are to be pointed out with deference and courtesy. The corrections are to be received in the same spirit; the approbation of the academy will be expressed without praise, and in accordance with a prescribed formula. Works endorsed by the academy, after such scrutiny as has been mentioned, may be published by order of the French academy; but no academician may indicate his membership in the academy on the title page of a work not submitted to the criticism of his associates, or not approved by their action. The rules which the academy prescribes in respect to language or orthography must be followed by all academicians in prose and verse. All relation of the confidences of the academy, in criticism or praise, is forbidden under penalty of disgraceful and irremediable expulsion.

By these severe methods, the literary men in Paris, in the middle of the seventeenth century, endeavored to hold themselves and their countrymen up to a high standard of literary excellence. The results have been apparent from that time to this, in the clearness, the fitness, and the grace which have characterized French writers, not only those of genius and erudition, but those of humbler standing. In later days, other academies in Paris have shared with the French its lofty rank, and perhaps there is less reason now than there was two centuries ago, for such concentrated action in the improvement of the French language, and in the promotion of a pure style; yet no one can read the story of those primitive days without admiration for the spirit which conceived this lofty idea of the benefits of literary criticism, severe and considerate, and which upheld the advantages of co-operative efforts in the advancement of letters. Among all the literary clubs of the world, none has attained to such acknowledged authority, none has come so near to immortality, none has had such wide-spread influence, as those which sprang into life at the magic touch of Richelieu two centuries ago.

BACTERIA.*

This class of organisms has lately come into great prominence on account of the relations they are known to possess to the causes of disease. In popular articles the term bacteria is less often applied to them than that of microbes or simply germs. They are spoken of as germs from the fact that it is due to their rapid growth and multiplication in the human system that many diseases are produced.

In scientific classification the bacteria belong to the class of organisms known as Infusoria, so called from the fact that they are always found in infusions of organic matter. It is only necessary to add a few leaves or stems of hay or shreds of meat to a glass of water and allow it to stand for a day or two to produce myriads of these organisms. Those who prepare them in this way for microscopic examination would do well to examine the infusion at stated intervals after the time of preparation; for there are very many species of bacteria, and each species has its own generation. In about twenty-four hours after the infusion has been made, a small drop of it placed under the microscope will usually be found to be teeming with minute organisms of a spherical shape. Twelve hours later many others of a rod shape, either straight or wavy, will probably appear. In the course of two or three days still others of a spiral or cork-screw shape will be present. It is difficult to imagine a scene of greater activity than that which presents itself to the eye at this period. The field of vision is teeming with incessantly active living forms darting hither and thither at every angle, and with the speed and directness of flying arrows. All of the several forms described above will probably be present, and all are constantly active except the small globular ones. These seem to have no power of motion.

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*From the Country Gentleman.

The causes of their movements were not well ascertained until within a few years. It is now well established that in the case of several forms the movement is due to the vibrations of cilia, of which there are only two present, one at each end of the body. Imagine a slender rod, straight or waved, with a delicate vibrating hair at each end, and you have an idea of the appearance of these forms.

When it comes to consider the size of bacteria, one must be prepared to receive some very extraordinary statements. The smallest (spherical in shape) are known not to be larger than one thirty-thousandth of an inch in diameter. It seems scarcely credible that bodies so exceedingly minute can be measured with approximate accuracy. But when it is considered that object glasses have been constructed capable of magnifying 2,500 diameters or, by taking the square of this, capable of enlarging the area of an object 6,250,000 times, it is readily seen that a minute body may be so enlarged as to allow its being measured with a near approach to exactness. Taking these organisms then at one thirty-thousandth of an inch in diameter, it follows that 900 millions of them could lay side by side on a surface an inch square. A film of matter one inch square, and one thirty-thousandth of an inch in thickness, if gathered into the form of a sphere, would be very much smaller than a drop of water. We arrive then at the astonishing conclusion that there are living organisms so exceedingly minute that more than a billion of them, or a number equal to the population of the earth, can exist in a single drop of water.

Not less remarkable is the exceeding rapidity with which these organisms multiply. It has been calculated by Cohn, the eminent German investigator, that a bacterium divides into two (they multiply by self-division), in the space of an hour, and that each one thus formed, itself divides at the end of a like time, and so on. At this rate, at the end of twenty-four hours a single organism will have amounted to about sixteen millions and a half; and at the end of a week, it will have multiplied to the incredible extent of requiring a number of fifty-one figures to express it. The same observer has expressed the results of his calculations in another way, by saying that "the bacteria issuing from a single germ would fill the ocean in five days."

The question arises, why these organisms do not overwhelm us with their abundance, seeing that they increase with such great rapidity. The answer is, that their increase is limited to the supply of food. As soon as the food material in a liquid containing them is exhausted, they perish.

Beside multiplying by self-division, they increase by means of spores. These are minute bodies, comparable to seeds, which form in the substance of a bacterium and subsequently develope into new beings. These spores remain alive after the death of the bacterium containing them, whether death be caused by the drying up of the water in which they are living, or by subjecting it to a boiling temperature. It is this fact of the resisting power of the spores to all ordinary destructive agencies that has caused so much difficulty in determining whence bacteria arise, whether, as in the case of all ordinary living things, from a parent organism or, as many for a long time supposed, by a process of spontaneous generation out of the organic matter of the infusion. For it was found again and again, that while all bacteria were destroyed by boiling the infusion containing them, yet, even if it were hermetically sealed before cooling below the boiling point, in a few days it would again be teeming with life. The supporters of the spontaneous generation theory claimed that this was irrefragable proof of the correctness of their view; but those who held to the contrary opinion were finally able to show, to the satisfaction of all, that the organisms which developed in the boiled liquid, sprung from spores which had resisted the high temperature.

These spores are known to be present in all ordinary atmosphere, floating about like fine dust. It is they which cause all forms of putrefaction, whether of animal or vegetable matter. No sooner is any dead organic matter left exposed to the air, than these spores settle upon it, and by their active vital processes cause that fermentation called decay. So that it has been well said that "putrefaction is a concomitant, not of death, but of life." As is well known, decay is prevented by cold; this is not due to any preservative quality in a low temperature, but simply to the fact that bacteria are not able to thrive except under moderate warmth.

As to the chemical decomposition of bacteria, they agree with all the lower forms of life in being made up of the nitrogeneous compound called protoplasm. They are like other forms, too, in consisting in structure of an outer transparent envelope, and a more granular inner part.

A FISH-EATING PLANT.*

Considerable attention has been attracted to the fish-eating habits of the common bladderwort, the first known plant which feeds not merely upon insects and such like inferior creatures, but upon the head and crown of the animal kingdom, the lordly vertebrates in person. Perhaps, therefore, some brief account of the murderous water-weed itself, and of its usual mode of proceeding in capturing its prey, may not be unwelcome at the present time. The plant was known to catch small insects and fresh water crustaceans in its tiny traps, and to use up their bodies as manure for its own development; but it was not yet know to be distinctly piscivorous. Last May, however, Mr. G. E. Simms, of Oxford, England, brought Professor Moseley a specimen of Utricularia in a glass bowl, in which were a number of young roach, just hatched out of spawn lying at the bottom. Many of the small fry were seen dead, held fast in the firm bladder jaws of the murderous plant. Professor Moseley being interested in this wonderful discovery of a fish-eating weed, secured another Utricularia and put it into a separate vessel, with fresh spawn and young fry of roach. In about six hours, more than a dozen of the fish were caught in the wee green gins. In most cases the fish were caught by the head, and when this is so the snout is pushed into the bladder as far as it will go, till it touches the opposite wall, leaving the tail of the poor struggling thing half free outside. Sometimes, however, the bladders catch the young roach by the tail, a fact which proves the truth of Mrs. Treat's view that the valve actually snaps at the prey, instead of merely allowing it to enter it passively. In one of Professor Moseley's specimens, a fish was caught by the yelk-bag, which fry carry in their early stages attached to their stomach: and in another instance two bladders had got hold of the same fish, one trapping it by the head, and the other by the tail.

Seen under the microscope the semi-transparent green traps, with the tiny silvery bodies of the dead fish half protruding from them, form very striking and beautiful objects. The big black eyes of the fish show out clearly, by the transmitted light, through the green wall of the cell that has caught them. Preserved in spirits, the specimens are less interesting, because then the bladder loses its green color, and the force of the contrast is considerably weakened.

After the fish have been for sometime trapped, they assume a slimy deliquescent appearance, and are rapidly absorbed by the glandular processes. As these processes project obliquely backward, Professor Moseley thinks it probable that they help to catch the fish and prevent them from escaping, in somewhat the same manner as the barbs of a hook or arrow, or as the backward pointing twigs of an eel-buck would do. Each fresh struggle and plunge must make the fish get deeper and deeper entangled in the trap, because the processes, catching in his gill or gill-slits, prevent him from moving backward, and compel him to move forward only.

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*Canadian Science Monthly.

One word as to the evolutionary history of this singular water-weed. It is a close relation of the beautiful pale green butterwort, whose graceful purple-blue blossoms are found on almost every bog or hilly brookside along the western side of our islands. Butterwort is itself an insectivorous plant, as are all its congeners; and Utricularia is only a butterwort which has taken to live in the water, and has so far adapted itself to its new conditions as to eat fish, as well as insects. By descent the butterworts are probably members of the primrose family, specialized for inhabiting marshy spots; while the Utricularia is a butterwort which has further adapted itself wholly to aquatic life in dirty ditches.

OUR CONSULAR SERVICE.

There is no more important service to the United States at the present time than that performed by our consuls resident in foreign countries. Greely's advice, "Go west, young men," is no longer applicable. The limits of the West have been reached and we are relegated to interior expansion. As agriculturists, we have overstocked the markets of the world with provisions. In this direction we cannot go further, for there are no purchasers at remunerative prices. Our inventors, in all probability, will continue to improve agricultural machinery and thereby lessen the cost of production. This advantage, however, will only enable us to successfully meet competition from other cereal-producing countries, like Russia and India, in European markets. We must, then, look in other directions than the present markets for the disposition of our surplus. These new markets are fortunately at hand south of us, not only on our own continent but in Africa. We are not likely to commit the folly of attempting to colonize, either in South America or Africa, but can, and ought to, form closer commercial relations with these countries. The late South American commission was well enough, but such temporary efforts do not meet the demands of the hour. We need permanent consulates, supplied with experienced and practical men who live in the countries to which our trade is to extend; men who can and will study their needs and advise us how to supply them. The agricultural resources of the countries named are immense and their development is at hand. As pre-eminently the nation of inventors, we can supply the growing wants which development and civilization imply. We have these southern countries at our door. Look south, with the eye on the ocean, and see how it narrows and brings Africa and Brazil close together. Look how West Africa and the southern Atlantic coast of our continent trend toward each other, their rivers emptying into the same ocean on opposite sides. Nor need the development of the vast countries south of us frighten our agriculturists. Their productions are different from ours and invite a change, rather than competition, the very thing needful to commerce. In order to learn the reason why Europeans have succeeded in obtaining the trade of Mexico, and countries further south, it is only necessary to compare and study the consular reports of these countries with those of our own government. Their consular offices are filled by men well qualified to study the wants and resources of the countries to which they are accredited. Their reports are full of the most interesting facts and suggestions bearing on the commerce and resources of the several countries. Their governments rightfully rely on the information thus obtained and, deriving therefrom practical benefit to their commercial interests, they extend to their consular officers proper aid and assistance. Of late years our consular service has improved and done some good work in the direction spoken of. We, however, have not yet given the attention to appointment, with reference to fitness, which is indispensable in order to derive all the benefits from our commercial agents which we are justly entitled to and should possess. Consular offices in foreign countries should be our homes, in the sense of meeting with a welcome when we enter them for commercial purposes or information. Our cousular offices and surroundings should be a substitute for what Europeans call "factories," places where all national commercial interests center, are nursed and cared for. A few thousand dollars properly expended in work about a consular office, in pursuing the policy above pointed out, cannot help but redound to our benefit as a trading nation in a ratio beyond all relation to the disbursement.

WEATHER REPORT FOR AUGUST, 1885.

Prepared by Professor F. H. Snow, of the University of Kansas, from Observations Taken at Lawrence.

A cool, delightful summer month. The number of hot days was only half the average. This is the fourth successive August whose temperature has been below the August mean. The rainfall, wind velocity and humidity were each slightly above the normal amounts. The cloudiness was below the average.

Mean Temperature—73.22 degrees, which is 2.79 deg. below the August average. The highest temperature was 95 deg. on the 8th ; the lowest was 53 deg. on the 26th, giving a range of 42 deg. The mercury reached 90 deg. 7 times. Mean temperature at 7 a. m., 67.35 deg. ; at 2 p. m., 82.88 deg. ; at 9 p. m., 71.34 deg.

Rainfall—3 70 inches, which is 0.11 inches above the August average. Rain fell on 8 days. There were 3 thunder showers. The entire rainfall for the 8 months of 1885 now completed has been 25.54 inches, which is 0.29 inch above the average for the same months in the preceeding 17 years.

Mean Cloudiness—33.87 per cent. of the sky, the month being 1.43 per cent. clearer than usual. Number of clear days (less than one-third cloudy) 15 ; half-clear (from one to two-thirds cloudy) 12 ; cloudy (more than two-thirds) 4. There were five entirely clear days and none entirely cloudy. Mean cloudiness at 7 a. m., 44.52 per cent. ; at 2 p. m., 27.74 per cent., at 9 p. m., 26.13 per cent.

Wind—S. W., 28 times ; N. E., 19 times ; S. E., 19 times ; S., 4 times ; N. W., 14 times ; N., 6 times; E., 3 times. The total run of the wind was 9,124 miles, which is 690 miles above the August average. This gives a mean daily velocity of 294 miles and a mean hourly velocity of 12.26 miles. The highest velocity was 30 miles an hour, on the 20th.

Barometer—Mean for the month: 29.065 inches : at 7 a. m., 29.089 inches ; at 2 p. m., 29.047 inches ; at 9 p. m., 29.060 inches ; maximum, 29.321 inches, on the 26th ; minimum, 28.778 inches, on the 6th ; monthly range, 0.543 inch.

Relative Humidity –Mean for the month, 71.2 ; at 7 a. m., 82.0 ; at 2 p.m., 53.6 ; at 9 p. m., 77.8 ; greatest, 97, on 11th ; least, 40, on 20th. There was no fog.

The following table furnishes a comparison with the 17 preceding Augusts :

August.	Mean Temperature	Max. Temperature	Min. Temperature	Hot Days.	Rainy Days.	Rain—inches	Thunder Storms.	Mean Cloudiness.	Humidity.	Number of Fogs.	Miles of Wind.	Mean Barometer.	Max. Barometer.	Min. Barometer.
1868.............	74.17	93.0	57.0	3	6	8.32	5	42.87	..	0	......	......	......	......
1869.............	79.30	96.0	56.0	16	13	6.46	3	45.49	78.6	1	......	29.092	29.235	28.924
1870.............	73.54	98.0	53.0	11	15	6.69	7	52.80	72.8	1	......	29.076	29.326	28.761
1871.............	75.34	100.0	45.0	16	9	2.76	4	39.44	....	0	......	......	......	......
1872.............	77.27	97.0	53.0	13	13	4.71	6	33.76	72.0	0	8,698	29.120	29.290	28.867
1873.............	79.38	104.0	56.0	24	6	0.90	2	23.87	57.8	0	8,190	29.134	29.330	28.974
1874.............	83.45	108.0	65.0	26	6	1.00	6	24.95	49.0	0	10,099	29.076	29.289	28.916
1875.............	72.50	91.0	55.0	2	7	2.90	3	32.79	68.1	0	9,484	29.080	29.328	28.919
1876.............	77.70	94.0	63.0	17	11	4.45	6	26.66	72.4	0	8,235	29.103	29.402	28.794
1877.............	74.01	97.0	51.5	7	5	2.30	3	29.57	72.0	0	8,572	29.076	29.289	28.916
1878.............	77.44	98.0	56.0	14	7	2.22	4	19.19	74.6	0	8,188	29.045	29.230	28.879
1879.............	75.48	99.5	49.0	16	5	1.03	5	28.92	63.8	1	6,835	29.053	29.386	28.801
1880.............	75.45	101.0	50.5	14	10	7.93	5	45.70	70.1	0	8,863	29.070	29 349	28.859
1881.............	81.23	104.0	62.0	29	5	1.57	2	31.29	62.5	0	7,991	29.050	29.178	28.875
1882.............	72.55	95.0	52.5	11	6	0.09	1	32.37	72.4	1	7,463	29.116	29.305	28.935
1883.............	72.04	92.5	52.0	1	6	2.12	4	39.89	77.0	0	7,640	29.158	29.353	28.885
1884.............	71.14	98.0	47.5	3	11	5.49	4	48.16	77.8	3	9,392	29.110	29.405	28.849
1885.............	73.22	95.0	53.0	7	8	3.70	3	33.87	71.2	0	9,124	29.065	29.321	28.778
Mean............	75.84	97.5	54.3	13	8	3.59	4	35.09	69.5	0.4	8,484	29.089	29.314	28.871

EDITORIAL.

THE DEAD LANGUAGES AND EDUCATION.

The sounds of conflict are wafted toward us from the East. Pedagogue and Savant are waging the long expected war over the question of the use of Greek and Latin in the schools. The educational and scientific periodicals of that region are full of the matter and we are beginning to feel interested in the West. The truth is, it has long been shrewdly suspected by western people that the knowledge of a couple of languages, spoken for the last time over a thousand years ago, is of very little use to college-bred young gentlemen who find homes among them. It has been discovered that there is nothing in the acquisition of these languages which fits men for the active and pressing duties of life; the very duties that cannot be ignored or broken through by the average youth if he expects to achieve success. When the student leaves college it is very seldom that destiny or talent permits him to seek in "lettered ease" the only recompense for classical erudition. When he leaves his Alma Mater he stands face to face with the world and he cannot avert its buffets, or seize the prizes that await him, by showing familiarity with dead and buried languages. Whatever field of labor he may choose, whatever prizes he may strive to attain, his work henceforward must be practical, and he must bring a practical knowledge to bear, to reach them or to secure any degree of success in the race. In the words of a recent writer:

"However high one's ideal may be placed, however sanguine his hopes may be, the final test of success will be the real and practical.

It becomes a question of considerable interest, therefore, to what extent the ordinary collegiate curriculum provides those following it year after year with this practical knowledge. An examination of that curriculum will show that in every college of this country one study at least has been enforced which has no bearing upon a practical knowledge of the world or its business or industrial methods, and to this extent therefore every graduate is weighed down at the very beginning of the race. This study is Greek. It will show that, including the preparatory course, every student has devoted about five years to this deadest of all dead languages, which can only be made available, and even then to a limited extent, by those who intend to follow the theological profession. Even in this profession, the records would prove that the most successful savers of souls, which we take to be the prime motive of the ministry, have been those who had the least knowledge of Greek and the most knowledge of the vernacular. The examination would further show that Greek has been pursued during these five years to the exclusion of the sciences and practical arts by which the graduate must earn his living, even if he do not succeed in accumulating a competence. He has given several hours a day to the study of this dead language, which has little or no affinity with his own, to the exclusion of such studies as geology, chemistry, botany, electricity, natural philosophy, political economy, systems of finance, general history, literature, natural history, book-keeping, engineering, and other important courses, some of which must have an immediate bearing upon his future work, and without which he is poorly equipped for his struggle. His Greek will do him no good in the doctor's office, the lawyer's office, the newspaper office, the railroad office, the counting room, the manufactory, on the farm, or in the mine, or the bank. He cannot utilize it in political office or on the rostrum. He can accomplish nothing with it for his own good or for the world's advancement. He has lost a considerable part of his precious five years which should have been devoted to useful studies; and unless he has a very retentive memory he will forget in a few years all the Greek he so toilsomely acquired.

How much better, therefore, would it be if the time which is wasted upon Greek could be devoted to translations of the classics, to general history, to the arts and sciences, and to such modern languages as French and German, not to mention English. Four years of work in these would fit any young man for a good start in the race. It is too late, of course, to benefit those who have already graduated, and if their judgment could be taken, it would be almost unanimous in protesting against the time which was squandered in the study of an absolutely useless language. For the sake, however, of graduates who are to come and who must meet a constantly increasing competition in the struggle for a living, college curriculi should be cleared of all useless studies. The world grows more and more practical, and the college should keep pace with it. The studies which have come down from the days of the cloister should give place to those which will enable the graduate to take his place in the densely crowded and eagerly competing throng with some show of success for the prizes."

SCIENCE AND SPIRITISM.

In the August Review a correspondent takes scientific men to task for ignoring, hitherto, the evidence of the truth of spiritualistic claims. While it is quite true that the leaders in modern scientific investigations, with a few exceptions, do not lend credulous, or even interested, attention to the wonders related of so-called mediums, it must be borne in mind that their training and settled habits of thought unfit them to enter this new and mysterious field. They cannot even admit the possibility of the facts alleged; for modern science has been directed undeviatingly towards the reduction of the chaotic phenomena of nature to a body of facts which exhibits the reign of law. Every cumulating discovery, or induction, in science, has helped along this movement until the savant has almost become a prophet—till cause and effect are each only the unknown terms of a problem which can be solved by a knowledge of the other. Now an admission that, side by side with the orderly procession of nature there exists a disturbing influence, an element which can operate to perturb and annul the laws which govern phenomena and set at naught the wisest induction, is more than can be expected from votaries of science. Such an influence is, in fact, inconceivable to the physicist.

Our correspondent will find in the English *Journal of Science*, for July and August, the opening articles of a controversy on this very subject. The controversy arose over a paper by the eminent zoologist, A. R. Wallace, (who is also a spiritualist,) entitled "Light;" and while his critic opens his side of the case with the statement, "It is no longer possible to ignore the phenomena known collectively under the name of Spiritualism," he proceeds to say: "Science is based upon what we, for want of a better name, term law. Spiritualism rests upon will. Science—and not merely our present Science, but any possible Science, so far as I can conceive it—takes its stand upon the causal nexus, upon the regular sequence of cause and effect. * * * * Now will,—finite will at least—is, I submit, the very antithesis of law. Where will—arbitrium—comes in, we have, of necessity, the arbitrary. The most of us, indeed, * * * have all along recognized one infinite unvarying Will as the ultimate cause of all phenomena. But such Will, being unchangeable and entering at all times equally into all phenomena, occasioned no difficulty. Nor has it been possible to deny that the wills of men and the lower animals * * were capable of interfering to a limited extent and in certain directions with the order of Nature. But, according to what was considered established in the earliest half of the present century, men and animals could act upon anything outside of themselves only where they were personally present, or where there was material physical connection between the agent and the object acted upon. * * * With the advent of Spiritualism all this beautiful simplicity has been swept away. If spiritualists are not mistaken, there are around us numbers of finite, invisible beings, of unknown powers aud unknown intentions, capable of interfering with the order of Nature. * * * To me it seems that if these contentions are true * * * there are introduced, so to speak, into every equation a number of unknown quantities rendering it forever insoluble. We can only say 'such results will follow under certain conditions, if no spirits think proper to interfere.' * * * We are, in short, put to intellectual shame and confusion."

There is another view to be taken of this question which may possibly explain the antagonism of scientific men toward any phase of occultism. We have only just escaped, during this century, from the domination of a thousand superstitious beliefs which weighed upon our ancestors. Ghosts, elves, witches, goblins, were to them the most appalling realities. Their personality entered into the operations of nature, and people forgot the tempest and the plague in horror at the cruel intelligences that animated them. Against these popular superstitions Science made a halting and painful progress; yet every step forward cleared men's eyes more and more to see in the phenomena around them no potency or motivity that did not spring from the operation of the laws of Nature. In time Science was victor over superstition; and is it strange that its votaries are averse to fighting over again the battle with "chimeras dire?" No longer suffering from "the ever haunting dread of the interference of spirits," thanks to science, we cannot return to the "bondage of the Middle Ages."

When spiritualists can harmonize their beliefs with the known and attested facts of science, then they will become science and receive the sympathetic investigation of scientific men.

THE SPENCER-HARRISON IMBROGLIO.

Prof. Youmans' article in the August number of the *Popular Science Monthly*, on the "Suppressed Book," will fail to convince many that the publication of Mr. Harrison's letters, without his consent and with adverse comments, was the fair thing to do; yet the attitude of the English press, and of Mr. Harrison himself, is so extremely unfair that the American public will feel little inclined to censure the act very strongly. The truth seems to be that there was more heedlessness in the matter than desire to do Mr. Harrison an injustice. It is true that it was the duty of the publishers to confer with both parties to the controversy, instead of with Mr. Spencer alone, before publishing; but Prof. Youmans is such a staunch friend of Herbert Spencer, and such a thorough disciple of his doctrines, that he thought only of extricating his leader from the brilliant dialectics of the great Comtist. His mind being single in this purpose, it never occurred to him to communicate with Mr. Harrison on the subject; he was too strong a partisan to look at both sides of the shield, especially as his desire to see Mr. Spencer righted was mingled with considerable indignation over Mr. Harrison's management of the controversy.

Now no one who knows Prof. Youmans, personally or by reputation, would for a moment think him guilty of moral obliquity in any sense. The bad taste and bad manners of Mr. Harrison in designating so eminent a man by the appellation of "cute Yankee editor," as though he were a type of Dickens' Yankee editor in Martin Chuzzlewit, cannot give much credit, in this country, to Comtism as the religion of humanity; and when this is supplemented by innuendoes that covetousness was the motive of Professor Youmans rather than partisan enthusiasm, he puts himself farther in the wrong than his opponents have ever been.

In a recent article in the *Century* it is stated that the only distributing points in the West, worthy of the name, are Chicago and St. Louis. Now Kansas City was so well satisfied with its career in this direction that it passed the matter by without comment; well knowing the profound ignorance prevalent in the East about Western affairs. But Minneapolis and St. Paul became testy at once, and, assured the effete East in the most solemn manner that they could be found on the map by a very cursory examination. The *Century* published the letter of correction good-humoredly, and thus what threatened to be a serious complication has been peaceably averted.

DR. W. G. THOMPSON in the *Popular Science Monthly* for September tells a rather apocryphal story of the West, *apropos* of the universal interest taken in the germ theory. He says: "The germ appeals to the average mind: it is something tangible; it may be hunted down, captured, colored, and looked at through a microscope, and then, in all its varieties, it can be held directly responsible for so much damage. There is scarcely a farmer in the country who has not read of the germ-theory. A cow-boy in Arizona was shot dead in the saddle recently, by a comrade, for the insult implied by calling him a 'd——d microbe'!"

THE appearance of the REVIEW this month is the natural result of the encouragement extended to it. The good will and interest manifested by the public in its success will, if continued, enable us to publish a magazine worthy of Kansas City and of the times. Its late issue is attributable to a "lost car" which contained the paper manufactured for it, and which was not "found" till almost three weeks from the date of billing the paper.

THROUGH an error, the article in the last number of the REVIEW on "Intellectual Love" was credited to Frederick Harrison; the author's name is Frederick Hartman, and he does not relish being translated, *nolens volens*, into a follower of Aguste Comte.

CORRESPONDENCE.

THE FATUITY OF STRIKES.

TO THE EDITORS OF THE REVIEW:

There is a spirit now rife in this country which presents an aspect so hostile and menacing to our national prosperity that we cannot afford to permit it to gather strength with impunity. It is a spirit that is totally opposed to all political virtues; that destroys patriotism and converts submission to law into hypocritical appearances; that places above the duties of citizens, and the laws of the land the sanctions of secret conclaves and the commands of mysterious magnates. There is something radically wrong with any movement which disregards the laws, or finds them in the way of its purposes; that surrounds its proceedings with mystery and seeks to gain its ends by secret codes and inquisitions. Such a movement would seem to have little to recommend it to the prosperous and intelligent; but there are so many specious claims advanced in its favor and such desire on the part of the American people to do justice to the oppressed, that the greatest wonder is that we don't all become strikers on the least occasion. For there is no doubt that labor has many just causes of complaint against organized capital. When a rail-road corporation seeks to realize from $20,000,000 worth of property an income quite adequate for double that investment by watering its stock fifty per cent, the laborer may be pardoned for feeling exasperated when his wages are reduced to accomplish this. But because defective laws permit such an outrage is it sensible or politic or virtuous for the laborer to expatriate himself—to show but a seeming obedience to the laws of his country while he follows blindly the dictates of his secret leaders? Because the rich do wrong must the poor follow suit? It has been frequently said that the virtue of a nation could be found alone amongst its humblest citizens; and it would be an unpleasing reflection to conclude that the lust for gold has corrupted all, rich and poor, high and low, alike.

There is another feature of this question which affects more nearly the laborer than he is likely to believe. It is a fact that when an individual gathers a little property together, he grows conservative, less inclined to applaud the lurid oratory of popular agitators. He has something at stake in the community, something for which he desires the protection of equal laws. When trouble comes, when the frenzy of riot and ravage sway the mob, such a man may be found at his post in the militia or in some other way testifying his respect for order.

The mechanic whose thrift and economy have given him a start on the road to competence is poor material for the labor agitator to approach; such advisers are better listened to by a mob like the one recently gathered in Chicago which announced so pathetically that "our children are crying for bread" while it emptied three hundred casks of beer. The man who drinks a glass of beer while his child is starving generally is a fair type of those who organize labor associations and live without labor from the hard wrung contributions of their dupes.

No other class is more hostile to the spirit referred to than the farmer. He cannot afford to have the business of the world stopped for a day. Every obstruction thrown in the path of commerce reacts on the farmer disastrously; and he would not willingly see its avenues closed by the acts of misguided, desperate and unthrifty men, especially when those acts are performed in open defiance of law and at the behest of unknown authorities. The farmer, more than any other citizen, needs the protection of law; and he will never wink at proceedings which savor of a new reign of terror and a later Jacobitism.

It is apparent from the nature of the case that the laborer is throwing away the sympathy and support of just the classes upon whom he must depend for help in extremity. If the present course of the Knights of Labor, and other organizations with similar high-sounding names, is pursued to its logical and inevitable conclusions, many of us will live to see the day when cordons of soldiers will replace the present unobtrusive executors of the law and every manufacturing town will have its garrison to enforce peace and order with the bayonet. This would be a sorry result for a land which promised so much liberty; which trusts so much to the intelligence of its citizens.

But "desperate diseases require desperate remedies;" if the ulcer on the body politic will not yield to compress, or plaster, the cantery or the knife are the only resources left.

C. H. D.

PHRENOLOGY DEFENDED.

NEW YORK, AUG. 29, 1885.

MESSRS. EDITORS:

Your correspondent, Dr. Browning, can be acquainted with the affairs of the Fowler & Wells Co., and with the *Phrenological Journal*, etc., but in a small degree, as Mr. O. S. Fowler has had no editorial connection with the *P. J.*, and no practical interest in the concern for upward of thirty years. He in fact, withdrew from the old firm in 1855; and since that time has published books on his own account. As regards our estimate of authority, besides personal observation, we regard the general drift of neurological conclusion to be favorable to the opinions held by Dr. Spurzheim and George and Andrew Combe. Dr. Browning has mentioned Prof. Caldwell in terms of respect, and we cannot except him from the roll of great Phrenologists. One who has read our magazine during the past fifteen years will testify to the fact that the whole field of modern neurology has been represented, and the most recent developements in pathology and experiment have been noted. There are some who have chosen the pursuit of lecturer, and gained reputation and money, but who contribute little to scientific progress. Such men may be acceptable to a large class of people, but you know, gentlemen, that their opinions are not always approved by those who are in the advance.

H. S. DRAYTON,
Ed. Phren. Jour. and Sci. of H.

SCIENTIFIC AND INDUSTRIAL NOTES.

APICULTURE.

An apicultural station has recently been established at Aurora, Ill., in connection with the Entomological Division of the Department of Agriculture. Mr. Nelson W. McLean has been appointed to take charge of the station, and Prof. Riley has instructed him to pay particular attention to the following subjects:

1st. To secure the introduction and domestication of such races of bees as are reported to possess desirable traits and characteristics; to test the claims of such races of bees as to excellence and to prove by experiments their value to the apiculturists of the United States and their adaption to our climate and honey producing flora.

2nd. To make experiments in the crossing and mingling of races already introduced, and such as may hereafter be imported, and by proper application of the laws of breeding endeavor to secure the type or types best adapted by habit and constitution to the uses of practical bee keepers in the United States.

3rd. To make experiments in the methods of artificial fertilization, and if possible demonstrate the best process by which the same may be accomplished.

4th. To test the various methods of preparing bees for winter—such as stimulating late breeding, removing the pollen from the hive in winter, feeding on sugar syrup, watering during long confinement, the stimulating of early breeding in the spring, the control of the swarming impulse and the prevention of swarming.

5th. To gather statistics concerning the bee-keeping industry in the United States, and obtain an approximate estimate of the number of colonies of bees kept, the number of pounds of wax and honey produced in the several states in the United States, and the value of the same.

6th. To make experiments with and observations concerning varieties of honey producing plants for bee-forage.

7th. To study the true cause or causes of diseases yet imperfectly understood and the best methods of preventing or curing such diseases.

8th. To obtain incontestible results by intelligent experiments upon scientific methods as to the capacity of bees, under exceptional circumstances, to injure fruit; i. e. to set at rest the ever discussed question of bees vs. fruit.

ORNITHOLOGY.

In response to a Memorial presented to Congress by the American Ornithologists' Uunion, and through the efforts of others interested in the subject, a branch of Economic Ornithology has been established under the Division of Entomology of the Department of Agrciulture; and Dr. C. Hart Merriam has been appointed as Ornithological Agent to take charge of this Divisional work.

The scope of investigation will cover the entire field of the inter-relation of birds and agriculture, particularly from the entomological stand-point. The inquiry will relate primarily to the food-habits of birds, but will include also the collection of data bearing on migration and geographical distribution of North American species. In this last inquiry the Department hopes to have the co-operation of the American Ornithologists' Union, Dr. Merriam being Chairman of the Committee on Migrations of said Union. The co-operation of farmers is solicited, and those having knowledge of food habits which are beneficial or detrimental to agricultural or horticultural interests are requested to communicate the same to Dr. Merriam.

The assistance of persons willing to aid in the collection of birds' stomachs is particularly desired.

Information is also wanted concerning the presence and habits of the so-called "English Sparrow" (Passer domesticus) in the Southern States and in the region west of the Mississippi.

Dr. Merriam will have his headquarters at Sing Sing, N. Y., until October 1, 1885, and after that date at the Department of Agriculture, and should be addressed accordingly.

ASTRONOMICAL NOTES.

A NEW COMET.

A telegram received at Harvard College Observatory, on September 1, from Prof. Swift, of Rochester, announced the discovery of a suspicious object by Mr. W. R Brooks, of Phelps, N. Y., and requested verification of the same. The rough position sent was R. A. 13h. 20m., Decl. -|-37o.

The evening of September 1 was cloudy at Cambridge, and the comet was not seen. September 2, Prof. E. C. Pickering found the comet, and the following approximate position was circulated by telegram and cable last night:

September 2d, 9h. R. A. 13h. 42m. Decl. -|-36o 37 min.

Daily motion in R. A.—3m. 12s., in Decl. -|-18 min.

The comet is of about 9th magnitude, with circular nebulosity 2 min. in diameter, some central condensation and no tail.

VARIATION IN THE NEBULA OF ANDROMEDA.

A cable message, received September 1 from Dr. A. Krueger, of Kiel, announces a variation in the great nebula of Andromeda, which was seen by Dr. E. Hartwig, a bright, star-like nucleus having been developed. The phenomenon was observed September 1 by W. H. Numsem, of Baltimore, and on September 2 by Prof. Pickering at Cambridge, the latter of whom secured a series of spectroscopic and photographic results.

ASTEROID PETERS (249).

A telegram received at Harvard College Observatory. on August 17., announces the discovery, by C. H. F. Peters, Clinton, N. Y., of an asteroid of the 12th magnitude. The discovery position is as follows:

August 16d. 14h. 40m. Wash. M. T. R. A. 21h· 58m, 40s. Decl. —15o 51min.

Daily motion, 60s. and on parallel.

PLATINUM.

The principal portion, or, in fact, nearly all the platinum used in this country, comes from the famous mines of the Demidoff family who have the monopoly of the production in Russia. It is all refined and made into sheets of various thicknesses and into wire of certain commercial sizes. At one time it was coined in Russia, but it is no longer applied to that use. We have obtained some very good crude platinum ore from South America and have refined it successfully, but the supply from that source is very small.

A popular error respecting platinum is that its intrinsic value is the same as gold. At one time it did approximate to gold in value but never quite reached it, and is now only worth $8 to $12 an ounce, according to the work expended upon it in getting it into required forms and the amount of alloy it contains. The alloy used for it is iridium, which hardens it, and the more iridium it contains the more difficult it is to work, and consequently the more expensive. When pure, platinum is soft as silver, but by the addition of iridium it becomes the hardest of metals. The greatest difficulty in manipulating platinum is its excessive resistance to heat. A temperature that will make steel run like water and melt down fire clay has absolutely no effect upon it. You may put a piece of platinum wire no thicker than a human hair into a blast furnace where ingots of steel are melting down all around it, and the bit of wire will come out absolutely unchanged, as if it had been in an ice box all the time. No means have been discovered for accurately determining the melting temperature of platinum, but it must be enormous. And yet, if you put a piece of lead into a crucible with the platinum, both melt down together, at the low temperature that fuses lead, and if you try to melt lead in a platinum crucible, you will find that as soon as the lead melts the platinum with which it comes in contact also melts and your crucible is destroyed.

A distinguishing characteristic of platinum is its extreme ductility. A wire can be made from it finer than from any other metal. A sample is shown, gauge of which is only one two-thousandth of an inch, and it is practicable to make it thinner. It has even been affirmed that platinum wire has been made so fine as to be invisible to the naked eye.

The draw plates, by which these fine wires are made are sapphires and rubies. You may fancy how delicate must be the work of making holes of such exceeding smallness to accurate guage, too, in those very hard stones.

But delicate as is the work of boring the holes, there is something still more delicate in the process that produces such fine wire as this. That something is the fitting of a long point on the wire to enable the poking of the end of it through the draw plate so that it can be caught by the nippers. Imagine yourself fitting a long tapering point on the end of a wire only one eighteen-hundreth of an inch in diameter, in order to get it through a draw plate that will bring it down to one two-thousandth.—Mining Review.

JAPANESE TECHNICAL APPARATUS.

The question of providing instruction in physical science in technical schools without costly apparatus was recently the subject of discussion before the Society of Arts in London, and an illustration of how this might be done was given from the work done by Prof. Gutherie, at South Kensington. The subject is referred to again in the issue of the Journal of the society for the 26th ult., in which an interesting account is given of the progress made by the Japanese technical schools in providing inexpensive appliances. The Journal says: "The Tokio school trains teachers to be sent to poor villages, where a collection of apparatus such as still in this country is regarded as a benefiting equipment for a labratory would be out of the question. Hence we see bamboo canes, corks, scraps of wire, old bottles, broken tools, flower-pots, in short things that in every village would go to the rubbish-heap, utilized for the construction of apparatus. To those who have not seen in the South Kensington museum what Prof.

Gutherie's pupils have done, it would appear almost incredible what those Japanese can do. They do not come up to the South Kensington work in point of finish and elegance, but this is not aimed at. To find the handiest material for doing just what is wanted is the point. No doubt the specimens exhibited in the country are picked, it is natural that they should be so, still they are representative. What simpler material for the construction of an electric machine could be thought of than two old beer bottles, one for the cylinder and the other as an insulating stand, a fragment of an old saw, an old bell, some long sharp nails driven in a row, some old handles and other bits of wood? Or, again, for a mercural air-pump, some short lengths of glass tubing, bottles, a tumbler, sealing-wax, string and caoutchouc? Yet, somewhat clumsy though it looks to our eyes, accustomed to delicate and finished instruments, it illustrates the manner of its acting even if it should not be capable of working with great perfection. Then there is a simple polariscope, a Coulomb's torsion balance, and a Cartesian diver, consisting of an eggshell, a small stone, a bottle and cover. A model to illustrate the principle of an equatorial telescope is especially simple. It belongs to another section, but illustrates simplicity. Into the cork of a bottle is put a short piece of wire, on to which is placed another cork. From this springs another wire, on to which a soft wax candle is pushed. Why a bamboo cane is not used instead of a wax candle is not apparent, but the principle is the same,

For chemistry the arrangments are just as simple, A retort stand is made from bamboo, a piece of wire-work ash-sifter for the retort to rest on, and a strip of bent bamboo to form a clip. Where bamboo cane can be used instead of glass, it appears to be done; for example, in place of a glass jar with a nozzle for burning hydrogen, a large hollow cane, stopped at one end with a tobacco mouth-piece, is used. Thus, perhaps, it is really hardly so simple, though, as the usual way of generating the hydrogen in the same bottle as that from which it was burned. Stoneware jars, however, seem in all cases used as retorts, for no glass retort is shown. Teachers often say they cannot show their pupils the decomposition of water; but here is a Buren battery—one 'cell' at least—made of a glazed pot, a porous pot, a coil of zinc and a stick of charcoal. The 'collector' is equally home made, except that the two test tubes probably have to be purchased, and these are cheap enough, it is in the putting together the skill lies."

PENETRATION OF LIGHT IN WATER.

Experiments have recently been conducted in the Lake of Geneva and elsewhere by M. M. Fol and Sarasin to determine the depth to which light penetrates in its waters. The method of experimenting was to submerge photographic plates of gelatine bromide of silver at various depths and develop the luminous images produced on them by rays penetrating from the surface. A coating of bituminous varnish, easily removable by alcohol or spirits of turpentine, served to guard the sensitive layer from the chemical action of the sea water. The rays affected the sensitive surface through a layer or back plate of glass. Oxalate of iron was employed as the developer, allowed to act for ten minutes. In clear sunlight during March and near Ville-franche-sur-Mer, they obtained images to the depth of about 400 meters. The images increased in strength as the depth diminished. In the Lake of Geneva they, however, only obtained images to the depth of about 200 meters, or half as far; and the authors conclude that in winter months sunlight does not penetrate farther than 200 meters, while in the Mediterranean it stops at about 400 meters deep.

COMMERCIAL VALUE OF THE EUCALYPTUS TREE.

The eucalyptus tree has been domesticated in Mexico with considerable success. It could hardly flourish better even in its native soil in Aurtralia. Naturalists are surprised when they behold the giant trees in the Zocalo and other portions of the city and learn that they are but a little over sixteen years old, for their size leads them to suppose they had grown twice that number of years. The wonderfully rapid growth, the hardness and durability of the wood, with its value for a wide variety of mechanical purposes and for fuel, and the sanitary qualities of the tree as a preventative of malarial disease where it is planted, make the eucalyptus one of the most valuable gifts contributed by one country to the flora of the world. Extensive forests of it are growing in Italy, in North America, in California, and in other countries where the climate permits its culture. In California its cultivation yields greater profits than are afforded by the vineyards; grape-raising being one of the most profitable industries of that flourishing state. It is valuable as timber for all sorts of mechanical purposes. For railway construction and maintenance it would be of great worth.

FORMATION OF COAL.

There is in Phœnixville, Chester county, Pa., an exemplification of the operations of nature as displayed in the formations of coal, where it can be found in actual process of transformation from vegetable matter to a soft, soapy carbonic substance, and the latter gradually changing to lignite and then again into the soft coal of the bituminous form. Go along the Pennsylvania Schuylkill Valley railroad, between the first passenger station of that system and the new one, and you will find a force of men cutting down the bank there, 18 or 20 feet high, and amid those rocks, perhaps 3 feet above the railroad track you will observe a black seam. The black seam is a laboratory of nature. From above, before the Morgan house was removed and the surrounding bank, big trees sent their roots down through the crevices of the rock till they reached the seam in question, which, in time, they filed with roots and fibres. The trees above died and the roots and fibres confined in the seam began to work, chemical changes took place, carbon was evolved and coal was the result. The labratory was opened by the building of the railroad before the slow process was fully completed, so that you can find there to-day the vegetable and carbonized matter and lignite and coal all together, proving, indeed, the popular thought that coal grows is true.

ASSYRIAN COLORS.

The colors which have revealed themselves during Layard's excavations at Nineveh, Wm. Linton says in the Architect, display sufficient evidence that they are not inferior to those of the ancient Egyptians, either in number, variety or brilliancy. Instead of the common earthy bole or reddle of the latter people, the Assyrians have left us a color almost equal to vermilion itself. The monochrome pictures which represented the chaldremes on the wall (Ezekiel xxiii 14,) are said by Gesenuius, the Septuaguint, and the vulgate, to have been painted by sinoper or rubica, a native earthy oxide, like Indian red; while both the great English versions of the Bible now in use, as the rabbis, translate the word at issue ("shashar," Jeremiah xxii, 14,) vermilion. At Khorsabad it appears that the red approached in hue to that brilliant color, while the sculptures at Nimroud exhibited a bright crimson or lake tint. Layard thinks there is no doubt of their having made great use of vegetable colors; the materials of which are so plenteous in the vicinity of Nineveh. The rapid evanescence of some specimens of blue and red on plaster which were bright and perfect in color when first exposed, would appear to favor a vegetable origin, as no susceptibility of the kind is known to characterize any mineral reds or blues with which we are at present acquainted. Layard claims for the older Assyrian period the same colors which have been attributed to the early times of the Egyptians, viz., blue, red, yellow, black and white. He also speaks of a green on the earlier monuments of Nimroud, and of green, purple, violet, brown, etc., enameled in paintings of figures on bricks at the northwest palace. In allusion to the analysis of Sir Gardner Wilkinson's specimens of the Alexandrian blue, by Dr. Ure, Layard conjectures that the coloring principle may be the same, but affirms that the Assyrian blue is much the brighter. He concludes that the color was derived from copper, as he found an old mine of that ore in the neighborhood of Nineveh. Layard considers the greens of Assyria to be similar to those of Egypt, which are in many instances composed of iron ochre and copper blue. The yellows and blacks also he conceives to resemble those from Egypt; and as specimens of the latter class of pigments he mentions calcined bone and black iron ochre. The whites are of alabaster and gypsum. At Khorsabad the French antiquarian, M. Botts, found green, red, black, white, yellow and blue—the latter very lively in color.

THE ORIGIN OF THE RAT.

The origin of the rat, like the birth of Jeames Yellowplush, is wrapped up in mystery. The ancients, according to a learned writer, quoted by M. Eugene Roland in his "Faune Sauvage," knew not the rat. Their condition was more gracious. But it is hard to be certain about the fauna of the ancients. When they use a word meaning mouse they may have had field mouse or common mouse or perhaps even the rat in their minds. Herodotus tells, on Egyptian authority, the same tale of an army defeated by mice who ingnawed their bowstrings as the Creek Indians tell of rats in their cosmogonic legend. This legend was fairly written in red, on a skin, and was kept during the last century in the Georgia office. Where is it now?

The Chinese have precisely the same story only they, like the Creek Indians, assign the victory to rats, not to the mice of the old Halicarnassian. Perhaps Herodotus meant rats, he knew nothing of cats till he went to Egypt, and about rats he may have been equally in the dark. Rats are not uncommon in Shakespeare, but Buckland says Genner (1587) first mentions the black rat. This, though older than the brown rat, is not apparently aboriginal. The Welsh name for rat means "French mouse," and perhaps the rat, came over with the Conqueror. An accomplished author on micromamologie thinks the rat was brought to Europe (involuntarily, no doubt) by the Crusaders. The brown or so-called "Norway rats," devour the black ones, and are later comers.

If a well known character was really "a rat in Pythagoras' time," the argument against rats being known to the ancients falls to the ground, and Shakespeare certainly thought that rats were common in the heroic age of Denmark. Rats in the zoological gardens are a good deal to be pitied. We all know the elephant of the fable. She one day trod unwittingly on a partridge, and killed it. Soon afterwards she found the nestlings of the partridge. "Poor little things!" said the elephant; "I, too, have been a mother;" and, with the kindest intentions, she sat down on the nest. In the same way the rhinoceros, never dreaming of harm, lies down on rats in his house, and compresses them quite flat. Such is their doom—an example, as far as it goes, of the ruthless laws of nature, and the survival of the fittest. The instinct of rats teaches them to shun a falling house; but not, alas! to avoid a sleepy rhinoceros.

COAL IN MEXICO.

A few years ago, in discussing the future of Mexico, it was no uncommon thing to find the leading journals of the country indicating that the advancement of Mexico must ever be retarded from the lack of coal within its borders. It was stated positively that it was practically without coal, and that none had ever been discovered which could be utilized. More recent investigation and a better knowledge of the facts show that Mexico has an ample supply of coal for all purposes, and it would not be surprising if its resources in this direction should be found sufficient to revolutionize the coal trade particulary of the Pacific coast.

A recent investigation of the coal trade in Sonora shows that a large anthracite coal field there exists, extending continuously from the summit of the Las Bronces range of mountains to the Yagui river, that contains 108 square miles more than the five anthracite basins of Pennsylvania and is as great as the aggregate area of all the coal field of England. It is claimed, also, that this coal is superior to the anthracite of Pennsylvania, having from 90 to 92 per cent. carbon, to 3½ to 5 per cent. waste, and leaves no clinkers when burned. In many places the workable seams exposed by erosion and meteoric agencies are from four to five feet thick; some ten, and others sixteen feet of excellent coal. What is true in regard to Sonora will probably be found duplicated in every other portion of this great country, the resources of which as yet are practically unknown. It is stated that English capital has already large interests in the coal fields of Sonora, and preparations are being made to build railroads and to otherwise utilize the immense treasures here discovered.

THE FIRST ATLANTIC CABLE.

Mr. Cyrus W. Field, celebrated the 27th anniversary of the laying of the first Atlantic cable, lately, by a complimentary dinner to about two hundred distinguished personages, at the Star and Garter Hotel, Richmond (England). Mr. Field presided, and amongst those who were present, we notice the names of Sir Lyon Playfair, M. P., Mr. G. Shaw-Lefvre, M. P.; Sir William Thomson, Sir Charles Bright, Sir James Anderson, Sir Henry Thomson, Sir George Elliott, M. P.; Sir Daniel Gooch, M. P.; Sir Julian Goldsmid, M. P.; Sir Arthur Otway, M. P.; Vice Admiral Sir George Richards, M. P.; Mr. George Renter, and many others. The loyal toasts, English and American, having been honored, the chairman gave "Success to the Atlantic cables; may they perpetuate the peace, friendship, and prosperity of two great kindred nations." He gave in brief terms, the history of the difficulties encountered in laying the first cable, and described the success eventually achieved. They had covered both earth and sea with a subtle and instantaneous means of inter-communication, which was destined, in its far reaching consequences, to bind together all the great English speaking family, and to play an important part in advancing the general well being and progress of mankind. Senator Hawley of Connecticut, Sir George Elliott, and Sir James Anderson responded; after which the chairman proposed the toast of "The men of science and enterprise to whom sub-marine telegraphy is so largely indebted," coupling with the toast the names of Sir William Thompson, and Sir Charles Bright. The "health of the chairman," proposed by the Lord Mayor, brought the proceedings to a close.

A PACIFIC OCEAN CABLE.

The following curious remarks are from the pen of the San Francisco correspondent of the Electrician and Electrical Enquirer of New York. What a boon tc commerce, and what a course of general satisfaction to the reading people of the world would a cable from the Pacific coast to China be; say along the 40th parallel to the Japenese Islands and Shanghai. In this way we could have pure and unadulterated war news, which must now be taken with considerable allowance after passing through the sieve of a British censorship. This cable was contemplated some eight or nine years ago, and the United States steamer Hassler took soundings, but because it did not promise an abundant return for the money to be expended, it was allowed to drop. In a few years when Russia will control the Persian Gulf and the Sea of Oman, she may unite with China in establishing direct cable communication with the western hemisphere: unless England forestalls her by connecting Victoria B. C. with Yeddo Japan. England very seldom unites with other countries in promoting any scheme for the public good unless she is to derive the greatest benefit therefrom.

A CEDAR GROWING FROM AN OAK.

Mr. J. Brundage, sends from Challenge Mill, Yuba county, to the Sacramento Record-Union, a photograph taken by him of a singular growth. It represents a mountain oak, two feet in diameter at the ground and fifteen feet in height, at a point where it appears, at some time quite remote, to have been broken off. Each side of this break, which evidently left a cup-like indentation, grows out on one side and up on the other limbs bearing the usual foliage. But from the point of the supposed break rises out of the oak, and growing firmly from it, a cedar tree, which is about thirteen inches in diameter, and rises straight as any arrow between twenty-five and thirty feet. It is as shapely and handsome a cedar as one could wish to see. It is situated about three miles from Challenge Mills, and is in the high Sierras. It is a remarkable curiosity, and is so regarded by all who visit it. Whether the cedar grows after the manner of a graft, or whether it has a tap root extending down through the oak, are questions to be determined. Only one instance recalled of a similar growth is in the Calaveras grove of big trees, where some years ago was seen a small sugar pine growing out of the fork formed at a great height by a limb and the trunk of the giant sequoias. Evidently the sugar pine seed, being there lodged, found sustenance sufficient after germination to feed the pine growth.

A FIRE-PROOF SUIT.

A man in a helmet suit set fire to a house at Oak Point Tuesday evening, says the New York Herald, and going amid the flames cooked a steak upon a burning window sill, and, sprinkling it with red pepper, ate it without a sneeze. Thirty gallons of petroleum had been sprinkled over the inside building, and when this ignited the heat became so intense as to drive the spectators away into the shade. There were no terrors in this for the incased individual however, for he threw away his dishes, and resting himself upon a crackling stool opened a bottle of wine, and lighting a cigar, drank and smoked until his table, stool and wine, and cigar were all consumed. There was an opening in the face of the helmet, through which the inner man was refreshed and after these diversions the opening was closed, and with a yawn the man lay upon the floor with a seething log for a pillow and proceeded to take a nap. But there was too much excitement outside to allow of quiet, undisturbed slumber, and arising with a petulant air the would-be sleeper seized a fire brand and darted forth to drive his tormentors away. The man is a native of Sweden, named Ahlstom. He invented the suit, the outside of which is made of mole skin and the inside of rubber. A small hose is used to fill the space between the parts with water; and another hose supplies the man with air from outside the burning building. The act is merely curious, not of practical value.

A THINKING MACHINE.

A cultivated gentleman of French descent residing in Gallipolis, Ohio, who has been an invalid for several years, has just received a patent for an invention of more than ordinary merit and of a peculiar character. It excites the wonder and admiration of all who behold it. Many declare it the equal, in general untility, of the sewing machine or telephone. It is perfectly wonderful in its operation, and yet so simple in its action that a child can learn to use it in a few minutes. It consists of a pair of scales which announce with unerring accuracy the value of any number of tons, pounds or ounces at any price. For instance, a ham is placed on the scales. Its weight is twelve and three-quarter pounds, and the price is 12½ cents per pound. A sliding weight is moved along the scale beam until the ham is balanced. In the notch where this weight stops will be found the worth of the meat in dollars and cents to a fraction. Again, suppose a grocer is asked for 50 cents worth of tea. The price is 78 cents. One indicator is set at fifty, the amount wanted, the other at seventy-eight, the price of the tea. Tea is poured into the scoop until the scale is balanced, when the quantity of tea is found to be correct as if several minutes time had been consumed in making the calculation.

A MONSTER GLOBE.

Detailed accounts are given in the Berlin and Paris papers of a monster movable globe made of copper, the work of a blind clockmaker, and on the construction of which seventeen years were spent. The globe represents the earth, and like it, turns on its own axis by means of a mechanism; an artificial moon moves round the Globe in twenty-eight days and six hours, while a movable metal band on which the hours are marked indicates the mean time in the different parts of the earth. Round the upper portion of this immense globe, which weighs a ton and a half, and whose surface measures 126 feet in diameter, spins a railroad car capable of holding six persons, and which serves to give a better view of the regions of the North Pole. The painting of the globe is done in oil, and necessitated the employment of two men during an entire year. The sun is represented by an intense Drummond calcium light, which enables the spectator to watch intelligently the origin and change of the different periods of the day, the early dawn, the twilight, eclipses of the sun and moon, etc.

AMERICAN EXHIBITION AT ROME.

A permanent exhibition of United States products will be opened at Rome, Italy, on November 1st of the present year.

Rejuvenated Italy is a non-manufacturing country with a population of 30,000,000, and the value of its yearly imports is about $260,000,000. The density of population, it will be readily understood, is of advantage to exporters in more than one way; and its almost insular position places its chief markets in easy communication by sea with the rest of the world. To the American exporter the country presents a population equal to that of all the South American states, and confined to a territory of comparatively small proportions and easily reached at nearly all points. In addition to this, a comparison of its imports with those of the countries to the south of us show that they equal those of Mexico and all the Central and South American states considered together.

The exhibition is projected by some of the most prominent Italians, and will be conducted under the auspices of the Italian government and the United States Consul-General. It will have forty-one branches in the different Italian cities, and its getters-up and managers promise to do all in their power to encourage trade between the two great Nations. The permanent exhibition is to be free to all, and only such goods are invited as are apt to find a sale or to meet a want in Italy or the Mediteranean ports. The charge to exhibitors is only $15 for twelve months, an exceedingly reasonable amount, especially when it is considered that the exhibition company takes full charge of the exhibit on its arrival in Rome.

THE PURCHASING POWER OF A DOLLAR.

The Boston Commercial Bulletin compares the purchasing power of a dollar in 1885 with that of the same unit of value in 1875, '55, '45 and '25. In doing so it takes the average wholesale prices of fourteen leading commodities, viz: wheat, corn, coal, iron, salt, pork, beef, rice, sugar, butter, cheese, cotton, wool and leather. First, the price of these as per fixed quantity are given, that is to say, wheat is quoted by the bushel, corn and salt by the sack, coal and iron by the ton, pork and beef by the barrel, and the rest by the pound. The result of the comparisons is to show that in the half of a century between 1825 and 1885, wheat advanced 11 cents, beef $1.50, rice 1¼ cents and butter 3 cents. Pork suffered the least, losing only 30 cents per barrel, while coal declined from $9.50 to $3.85, iron from $55 to $18, and salt from $2.60 to 85 cents. But the more interesting table is that in which the Bulletin presents for comparison such quantities of each commodity as, at market quotations in 1825, would be worth $55 or about that amount. It is given below, and will be well worthy of careful examination:

	1825.	1845.	1855.	1875.	1885.
Iron, per ton....	$55 00	$ 4 00	$ 31 75	$35 00	$18 00
Wheat, 60 bushels	54 60	67 20	142 80	68 40	61 20
Corn, 95 bushels.	55 10	61 75	103 80	59 85	50 35
Coal. 6 tons.......	57 00	21 50	39 00	29 82	23 10
Salt, 20¼ sacks...	54 94	28 70	21 73	43 75	17 42
Pork, 4 barrels...	53 20	45 60	71 00	81 48	52 00
Beef, 6 barrels...	54 00	45 00	67 50	54 00	68 00
Rice, 1,833 lbs....	55 00	67 21	76 37	137 47	96 25
Sugar, raw 650 lbs	55 50	32 50	39 00	32 50	22 50
Cutter, 366 lbs....	54 90	27 45	82 35	82 35	65 88
Cheese, 740 lbs...	55 00	51 80	66 60	92 55	44 40
Cotton, 275 lbs...	55 00	17 87	24 75	40 25	30 25
Wool, 275 lbs.....	55 40	43 20	48 00	68 80	46 40
Leather, 230 lbs..	55 20	39 00	52 80	57 60	55 20
Average.....	$54 90	$42 93	$61 96	$63 13	$46 85

INDESTRUCTIBILITY OF GOLD.

Sir Henry Vivian: Gold may be said to be everlasting, indestructible. The pure acids have no effect upon it. Air and water are alike prohibited from working in destruction; while to baser metals they are decay, to gold they are inoculous. Bury it through long ages, and when the rude tool of the excavator again brings it to light, while everything around it, and originally associated with it, has returned to dust from which it sprang; while the delicate form which it adorned has become a power so impalpable as to be inappreciable; while the strong bone of the mighty warrior crumbles as you gaze upon it; while his trusty sword lies a mass of shale rust, the delicate tracery in gold which adorned it or the finely wrought tiara which encircled the lofty brow of the fair damsel, is there in its pristine beauty, perfect as when it left the workman's hands and became the joy of the fleeting moments. Yes, days, years, centuries have rolled by; mighty empires have risen and fallen; dynasties that dreamed their power was to be everlasting have passed away; armies have marched, conquered, and become nerveless with decrepit old age; cities teeming with population and commerce have become the dwelling place of the owl and the bat; the very pyramids themselves, raised in the pride of power, and destined to be forever, have crumbled, and are crumbling, and yet that thin filament of gold has stood unchanged through all these mighty changes. It has withstood triumphantly the destroying hand of time; it is to-day what it was three thousand years ago. Surely it is a noble metal worthy of all admiration.

BARTHOLDI'S "LIBERTY."

In connection with the scheme for providing a pedestal for the colossal statue of "Liberty" presented to the American nation by France, the New York (N. J.) Journal has on exhibition at its office an exact reproduction of Bartholdi's great work, in bronze, standing upon a handsome mahogany case containing an electric attachment. When a quarter of a dollar is dropped into the aperture at the base of the statue, a cam inside revolves, depositing the coin in a locked drawer below. At the same moment the cam presses a spring, which completes an electric circuit between a set of Bunsen cells beneath, and a minute Eddison incandescent lamp which Miss Liberty holds aloft in lieu of a torch. The torch flashes its tiny light for a moment at every coin that enters the drawer.

A NEW FIBRE.

Some time since the Two Republics noted the discovery in Nuevo Leon of a new fibre resembling flax. Since then a Laredo capitalist who discovered it has been forming a company to develop the fibre on a large scale. Speaking of this discovery to the representatives of this journal, he says the plant is found in abundance in the arid lands of Nuevo Leon, and seems to flourish on a rocky, desert soil, which is unserviceable for other products. Reproduced in good soil and cultivated, it will grow very rapidly, reaching a height from two to five feet. The shoots are of different thicknesses, all having abundant fibre, which is beautiful in appearance, solid, strong, and easily drawn out even by hand from the shoot. It is a straw color, but easily bleached. The fibre is finer and stronger than flax.—[Two Republics, City of Mexico.

A curious thing about the excavation of the ruins of the Atrium Vestæ, at Rome, was the discovery of a number of Anglo-Saxon coins, dating from 901 to 946. How did these foreign pieces happen to get dropped in the heart of the Eternal City? This puzzle is rather more difficult than that involved in the finding of pieces of Roman money in every part of Europe. But the number of ancient Roman coins dug up here and there is astonishing. A few years ago borings on the brink of some rather well-known hot springs in the east of France brought to light no fewer than 4,700 Roman coins. Four of these were gold coins of Nero, Hadrian, Faustina, Jr., and Honorius; 265 were silver coins, principally of Imperial and consular types, associated with a few Gaulish coins. Of bronze there were as many as 4,468—large, middle and small brass—ranging over a considerable period. With the coins were associated other objects, such as statuettes, pins and rings, in bronze, gold, lead and iron. What does this mean? Simply that well-to-do Romans were quite as much in the habit of resorting to thermal springs for pleasure and profit as millionaires of our own day,

Well may we doubt the success of the alchemists of old in their search for the "elixir of life," but if the views published in England by Mr. W. O. Dawson are correct, modern science at least appears to be able to retard the progress of old age. Mr. Dawson tells us that the changes which produce old age are due to an excessive action of the oxygen we breathe and to accumulation of lime salts in the body. He does not state whether the oxygen effects may be in any degree counteracted, but he believes that life may be prolonged by reducing the calcarious deposits to a minimum. This he would accomplish by a plan suggested by Mr. DeLacy Evans. The plan is to avoid food containing a large proportion of earth salts—such as the meats from old animals—and to use daily, after middle life, several glasses of distilled water containing a few drops of phosphoric acid. Distilled water is necessary on account of its great solvent power.

Col. Snowden, former superintendent of the Philadelphia Mint, has perfected an invention which, it is said, will render it impossible to counterfeit United States coinage. This invention consists of a twice bisected steel collar, which when attached to the dies will form raised letters upon the peripheries of the coins. The new coin cannot be imitated by counterfeiters, because it cannot be made in a mold or by any process except the steel collar, hand engraving or a screw press. Milled coins can be lifted out of a mold without injury, because the lines upon their edges are straight up and down. The new ones have letters and stars on their edges, and cannot be taken out except by injuring them and mutilating the molds.

Paper it is said is taking the place of cedar in the making of lead pencils. A novel use for paper has been found in the manufacture of gas-pipes In addition to being absolutely tight and smooth, and much cheaper than iron, these pipes are of great strength, for when the sides are scarcely three-fifths of an inch thick, they will stand a pressure of more than 15 atmospheres. If buried under ground they will not be broken by settlement, nor when violently shaken or jarred. The material being a bad conductor of heat, the pipes do not readily freeze.

The Los Angeles Herald describes a specimen of the vampire family recently caught there: "This huge specimen measured twenty inches from tip to tip of his wings, and was pretty well armed with teeth and claws. His head was as large as the heads of four or five bat heads combined, and well hooded with two ears fully as large as a half dollar. His majesty was as vicious and war-like as a scorpion or tarantula when confined, and his bite would probably be as dangerous."

Prof. Joseph Stanley Brown, one of the geologists of the National Survey, has resigned and his resignation accepted by Secretary Lamar. Science loses in him a close observer and careful recorder of mineralogical and geological dates. He will, however, we trust, be restored to active labor as his resignation, which is entirely voluntary, is for the purpose of pursuing special scientific study at New Haven.

A Sweedish engineer has succeeded in producing a new explosive, which he calls romite. It is claimed that no elaborate machinery is required in the manufacture of this explosvie, that it will not freeze, and cannot be exploded except by ignition. Experiments have been made with the new explosive for blasting, and it has also been tried in shells, the results, it is said in both cases being entirely satisfactory.

There is a wonderful fish in Goose Lake, Oregon. It is called by some the greenback fish, for it is certainly an inflationist. It has the power to fill itself up with air until it becomes very much like a round ball. Of evenings, about sundown, they may be seen playing on the surface of the water. They will swell up by taking in the air, and the wind will blow them over the lake They reflect all the colors of the rainbow, and when sporting over the lake are a grand sight.

Eyesight among civilized people is by no means as strong as among savages. A gentleman in Zululand, by the assistance of a powerful glass, made out two distinct objects on the horizon, which he guessed to be a mounted man with a walking companion. The Zulus with him was able at once to inform him who the gentleman was, and that he was accompanied by his wife on foot.

In 1879 only 103 fossil insects from the carboniferous rocks of the whole world were known, but during the last five years a great number have been discovered, including 1,400 from Commentry, France, a few from Saarbruck, Kleinopitz, Lugau and other Continental European mines, and a very considerable number from the mines in this country.

Late Belgian experiments have had the object of preserving wood by exhausting the air from the pores and causing liquid gutta-percha to take its place. The gutta-percha is liquefied by being heated with paraffine, and it hardens on cooling after being introduced into the wood.

According to late advices from Japan, every man of any means, and even the local officials, in the Toyama prefecture, is studying the English language. It appears to be a general belief that those who do not know the English tongue are behind the times.

A Japanese has discovered a process of making paper from seaweeds. It is thick in texture, and owing to its transparency can be substituted for glass in windows, and when colored makes an excellent imitation of stained glass.

A four-footed bird is found on the island of Marago, at the mouth of the Amazon. In time one pair of legs are changed into wings by as singular a process as that which make the tadpole a frog.

A cable message received at Harvard College Observatory, from Dr. A. Krueger, at Kiel, announces the observation, at Nice, of Tuttle's Comet, giving the following position :

August 9.6124 Gr. M. T. R. A. 7h. 23m. 43.1s. Decl. -|- 28 deg., 1 min. 24 sec.

The last word in the message, probably indicating motion (terrotin), is unintelligible.

MISCELLANY.

ROMANCES OF MINING.

So many misconceived notions are entertained about frontier mining towns and the bloodthirsty disposition of the inhabitants, writes a correspondent of the Philadelphia Press, that I have recalled from memory scenes that, while they may not counteract this belief, will, to a certain extent, show that romance and fate have a great deal to do with the promulgation of this notion. In 1867 one of the most productive mines discovered near Leadville, Col., was found by a Mr. Long, who, hungry, emaciated, and with a large old English penny in his pocket, "for luck," as he called it, went out shooting for a breakfast. A deer was his first shot; the animal died hard, struggled, kicked up the earth, and eventually subsided in a particular rocky spot. Long hastened to its side, and, instead of a dead deer, he discovered evidences of gold dust. Long informed his partner, a Mr. Derry, and they possessed themselves of the spot and became rich. That was before Leadville became what it is to-day. Hardly six months had passed, when news, rehashed, magnified and made sensational by eastern journalists, went travelling over the country that two gamblers, notorious characters, had waylaid a party of travelers, composed of a lady and three men, assaulted them, and, killing them, found in their pockets evidence of a rich gold mine and pre-empted it. Wilbur F. Story, then in the height of his power as a journalist, had seen the story. He knew Long, examined into the truth of the tale and gave a true version of it.

The Eberhardt Silver mine was discovered in 1868, near Elko, Nevada, by a boy who was working for a gang of men cutting ties for the Central Pacific railroad, then in course of construction. Elated with his success he disclosed his secret to a man who was foreman of the gang. The foreman pre-empted it and sold it, as guardian of the boy, to an English company of capitalists, for a large sum of money. Some friends of the youth, who were Germans, became interested in the matter and found he had been defrauded out of his rightful dues, and they instituted suit against the company to test their claim. The company compromised with them for some $500,000, and another sensational story came east, was published first in Boston, of the kidnapping of a boy by bloodthirsty cowboys, who asked a ransom for him, as he was the owner of a wealthy silver mine, and what gave additional color to the matter in Massachusetts at the time was the death of an immensely wealthy gentleman, who left his entire property, amounting to millions, to his son, a minor who was missing for a few days. I believe it was through the efforts of a Mr. Bacon, a Boston journalist, that the matter was investigated and the truth proclaimed.

Some six years ago Mr. Ernest Ingersoll published in Scribner's Monthly a very long article on Leadville, and I remember he mentioned the finding of the Camp Bird mine there by the Gallagher brothers, two illiterate sons of the Emerald Isle; but as he never told how they discovered it, and the sensation it produced east subsequently, I will relate it. These Gallagher brothers, Dan and Michael, were exceptionally Irish in everything, very poor, but honest, shrewd, and to a certain extent superstitious. One day, together, they started out with a hope of getting employment, and in crossing a piece of country contiguous to the silver mine, Dan stopped to tie his brogans or army shoes.

"Oh, Mickey, here's luck!" he exclaimed, picking up a small sized silver quartz.

They both examined it and discovered it was genuine rocky quartz silver, and they possessed themselves of it. Not long after, a paper published not fifty miles from Chicago, gave a sensational account of two Irishmen, with pistols and etceteras, "jumping" a silver mine, the rightful property of an old Scotchman, the whole thing originating in the fertile brain of the writer. Dr. Wood, then on the New York Sun, had a suspicion that all was magnified, and wrote a long article to a western paper, arriving at the truth.

There has been more romance connected with early Leadville than any other place on the frontier. One of the most morgue-like stories that was ever published, was revamped from a minimum of truth into a maximum of romance. It was related to a claim called the Dead Man's Claim, discovered near Leadville. A man came from the eastern part of New York hoping to establish himself as a physician. He was talented, educated, but very delicate, entirely unfitted to stand the hardships of a frontier life, especially a winter life, when, penniless and hungry, he found himself stranded and with no shelter but that afforded by stray saloons and gambling places, for Leadville was already overrun with physicians, lawyers, and men of brain. He had a few friends among the many happy-go-lucky fellows he met, and they helped him as best they could. Suddenly he was taken sick with pneumonia and died. The poor fellows who stood by him in his sick-room were determined that he should have a decent burial, so they clubbed together and raised a purse of $50. An old miner, "dead broke," and a sort of handy man around the saloons, named Parish, was given $30 to dig the grave, and $20 for a coffin.

It was in the dead of winter, the snow five feet on the level, so the body was taken out and buried in the snow, while Parish started at his work. The two men who had collected the fund for his burial got interested in a long game of poker, and after sitting nearly forty-eight hours concluded they would hunt up Parish and find out how he was progressing. So one morning they adjourned to the spot, and there was Parish digging away for dear life. He had struck a paying mine, and forgetting all about the body, was unearthing treasures. The two friends claimed their share. Parish would not yield. Eventually the affair was compromised and sold out to advantage to a company. Later the poor doctor was buried, and the matter became a ten days' wonder and died out as far as Leadville was concerned, when one morning Parish's attention was called to a long article in a newspaper of how he and a gang of murderers had in cold blood murdered a wealthy gentleman and "jumped" his claim. The matter was the occasion of a general laugh around Leadville, and poor Parish for sometime after earned the sobriquet of the "death dealers' jumper."

GREAT GAMES OF CHESS.

In the history of the Saracens, it is said that when Al Amin, the caliph of Bagdad, was besieged in his city by his hereditary enemy, Al Muram, he was engaged in a game of chess with his freedman and attendant, Kuthan. The enemy was advancing in tremendous force upon the city gates. Terror-stricken, the courtiers rushed in to warn the caliph of his danger, but he would pay no attention to them. "Let me alone," he said; "I see a checkmate against Kuthan." This ruler was so devoted to chess that he had his kingdom searched for all the good players, and had them brought to his palace, where, whatever their rank, he made them friends, and heaped gifts upon them. Among these was the slave Kuthan, who became the caliph's favorite antagonist in the game. The case of Al Amin furnishes a by no means singular instance of the absorption of interest possible in this fascinating game. King John was at chess when the deputation at Rouen came to tell him that Philip Augustus had besieged the city, but he refused to give them an audience until the game was done. Charles I. was engaged in playing chess when the news was brought to him that the Scots were going to sell him into the hands of the English, and manifested no interest whatever in the intelligence until his game was finished. So, too, John Frederic, Elector of Saxony, when imprisoned in 1547, was beguiling the time by playing chess with a fellow-captive at the moment when a messenger came to tell him that the Emperor had sentenced him to be beheaded before Whittenberg. He betrayed no agitation at the news, but proceeded with the game, and expressed the heartiest satisfaction at the close over the fact that he had beaten his opponent. The Hindoos say that chess was the invention of an astronomer who flourished several thousand years ago, and who was possessed of supernatural knowledge and acuteness. The Greeks claim that it was the invention of Palamedes to beguile the tedium of the siege of Troy. The Arab legend is that it was devised for the instruction of a young despot by his tutor, a learned Brahmin, to teach the youth how a king was dependent upon his subjects for his safety. Oriental chess is of two kinds, Chinese and Indian chess. The Chinese game is played generally in eastern Asia; but in India and the adjacent islands, and, with some slight modifications, all over the civilized world, Indian chess is played. The bishop is the elephant in India, the castle the boat, and the queen the minister; otherwise the pieces are identical with those known to us. There is a chess school in India with its salaried professors, and success in the game is held in very high regard. Monesh Ghutuck, it was said, could play a fabulous number of games when lying on the ground with his eyes closed. The complications of the game called the Indian problem are known all over the Occident as among the most difficult ever devised. The Chinese chess-board has sixty-four squares and a broad strip called the River Ho across the middle. The castle is known to them as the war-chariot, the bishop as the elephant, the knight as the horse, and for the king and queen they have a general and two officers. They have but five soldiers or pawns, and two cannon, the latter being able to move over the heads of the officers. The general, cannon and chariot can not pass the river. The Persians call chess Timour's game, because of the favor in which it was held by Timerlane, the great Tartar ruler who lived in the fifteenth century. This king found the game so easy that he introduced additional men and moves to complicate it. This was the origin of what is known as great chess in Persia, in contradistinction from little chess, the common game. This is played on a board with 110 squares and fifty-six men. A Persian emperor is said to have called one of his sons Sehahrohk because at the moment he received the intelligence of the infant's birth he was playing chess, and had just given check with his rohk (castle) to his adversary's king (sehah.) Kings and potentates have usually delighted in chess. Charlemange delighted in the game. So did King Canute or (Knut) the Dane. Ivan the Terrible, of Russia, died in 1584 of an apoplectic fit, caused by rage at a checkmate received from a subject. Queen Elizabeth was very fond of chess. So was Napoleon I. He opened his games badly, his biographer assures us, but when warmed up to the game he made some very brilliant moves. At St. Helena he played daily, going over on the board the battles that he had fought, and more than once declared that he ought to have won at Waterloo. Louis XII. of France was so fond of chess that he played it in his carriage.

Casimir II., King of Poland, in the twelfth century, prohibited the playing of chess in his dominions. A similar law was enacted by the Turkish Caliph Hakim, in the year 1025, punishing with the bastinado all who disregarded it. Louis IX. of France (St. Louis) forbade the playing of chess at court under the penalty of a fine, and Edward IV. of England had a law enacted strictly prohibiting chess throughout the kingdom. James I. detested the game. The Knights Templar abhorred chess, and so did St. Bernard, and very many other church dignitaries, but this was probably for the same reason that Montaigne gave, that he hated chess because it fascinated him so.

A civil war in France owed its origin to a game of chess. Regnault, a nephew of Charlemange, and Berthelot, a knight of the court, had a quarrel while at the game. Berthelot struck his opponent in his anger, whereupon Regnault lifted the chess-board, which, as the story goes, was of solid gold, and struck him dead. A factional war of several years followed, which involved half the kingdom.—[N. Y. Mail and Express.

A WHALE ENTANGLED IN A TELEGRAPH CABLE.

In August of last year some articles under the above heading appeared in the daily papers, referring to a very interesting account of the breaking of a submarine telegraph cable by a whale. The account in question was somewhat meagre in detail, and not altogether correct; and my excuse for resuscitating the matter is that I have lately received a history of the circumstances from an eye-witness, and perhaps the story is of sufficient interest to merit a place in your columns. It struck me at the time that the subject was far too summarily abandoned, and that those who had full information at their command should have given more details. For instance, one would like to know the depth of water at the place where the whale was discovered attached to the cable, and whether any fault existed beyond the damage actually done to the cable, by the whale in its efforts to escape, or if there was any break, due perhaps to some submarine landslip. And I may here mention that the cables laid along the coasts of Peru and Chili (the one now under discussion forming part of this system) have more than once been broken by these submarine landslips, which, I believe, have generally been found to correspond with some severe earthquake felt on the coast.

It was stated in the account referred to that the interruption of telegraphic communication was owing to damage caused by the whale. Now, if this were the case, one must believe that the animal, while groping about the bottom, had come across the cable, and had there gathered up sufficient slack so as to wrap several turns of the cable round it. It is difficult to understand how this feat could have been accomplished. Nor is this all; for, as more than a week had elapsed between the date of the interruption and the moment when the whale was discovered attached to the cable, we must also believe that during this time the animal had submitted to captivity, retaining for so long a period life and strength. In order to live, a whale must come up to blow; and if the one in question had done this, entangled as we are told, in the cable, it would have been obliged on each occasion to lift an enormous weight from the bottom, besides sustaining repeated injuries due to the strain of the turns of cable round it.

From my correspondent's letter, it appears that the cable was grappled for and hooked (how far from the point of interruption is not stated), and some considerable quantity picked up, when an abnormally heavy strain was noticed. The picking up was continued very slowly and cautiously, as it was supposed that the cable was to some extent buried. It soon, however, became evident, that the cause of the great strain was a huge mass, apparently attached to and coming up with the cable, and the astonishment of all on board may be guessed when it was seen that a whale some seventy-five to eighty feet long was entangled in several turns of the cable. On reaching the surface the animal commenced a series of plunges, which quickly resulted in the breaking of the cable close to the bows; and at the same moment the turns round the whale cut deeply into his body. After a few weak struggles and some spouting of blood and water, the whale lay motionless, the turns of the cable still remaining round it.

The ship, released from the cable, naturally drifted to leeward, and the stench emanating from the carcass is described as having been something awful. The cable appears to have been again grappled for, and picked up some little distance off, and the short piece attached to the whale at one end was buoyed at its other extremity. The repairing operations were continued, the whale meantime being sighted several times, and myriads of birds had collected around it.

The repairs being completed, the ship could not recover the short piece of cable attached to the whale, owing to the bad weather having suddenly set in, and it was necessary to lie-to during the afternoon and night. The next morning it was found that the whale had disappeared, and on recovering the piece of cable only a few pieces of blubber were discovered still remaining on the turns which had encircled the whale. The cable in the immediate neighborhood of the part which had imprisoned the animal was found to be much crushed, in many places the sheathing wires being forced open, the core destroyed, and the copper conductor broken, as if the whale in its endeavor to escape had tried to bite through the iron wires.

It seems a difficult matter to attempt a solution of how the whale became entangled. In the case of the Persian gulf cable to which a whale was found attached, I have heard it suggested that the animal, finding a portion of the cable suspended across some depression in the bottom, had tried to rub off, against the cable, lice which so much trouble these creatures, and in doing so had wrapped several turns around its body. I think, from the circumstances, that in the case now under notice such could not be the motive for the whale's interference with the cable. Perhaps some of your readers may be able to throw light on the subject.—[Cor. London Field.

A STORY OF TWO RATS.

A correspondent of "Land and Water" tells a story of two white rats which he had adopted as pets. The male was a quiet, commonplace sort of rat, acquaintance with whom afforded few incidents of particular interest. The female was a great coquette, and a regular domestic tyrant, exercising absolute control of her spouse and household. Always pleased with the gift of some dainty, she was, "rapturously delighted" if allowed to think she had stolen it. If the master would have a piece of sugar on the table, she would creep up and take it, retreating behind a book to devour it, as she hoped, unobserved. She was a relentless enemy to mice; and, when one of these animals was put into her cage, "she flew at it and slew it with a single bite, leaving it instantly, as a well-trained terrier does the rat it has killed." The first occasion of Anna Maria having little ones was quite an event. "When I went to the box, as usual, to give my little rodents a scrap of whatever I might have had, I found Augustus (the male) sitting out in the cold and looking terribly sheepish. On opening the sleeping compartment, there was Anna Maria, with something like a smile upon her shrewish little countenance, keeping watch and ward over nine ridiculously naked little offspring. On these occasions Augustus was completely effaced, He shirked the slightest responsibility; and I always had to make him up a separate bed, for sleep with his children he would not. If by chance he was forced to walk among them, he did so with an anxiety that would have done credit to an elephant stepping between eggs. As they grew up, assumed hair, and began to run about, he would allow them to take liberties with him, and even rob him of tidbits." The master thought the hay the naked little fellows were lying upon too rough for their tender skins, and put wadding in its place. "But, with a sneer of contempt for the stupidity of men in such matters, Anna Maria promptly cast out the wadding and bumped her progeny upon the hay again." In washing them, "she would roll them over and over with her paws, and lick them till the sparks flew; and they would utter plaintive little squeaks." But they throve splendidly. "Every night this graceful couple gamboled about my table while I read or wrote. It was a delight to me to watch them at their toilet or eating the food which they held in their delicate little paws When tired of play, they would clamber up to my shoulder and slumber, huddled together like two love-birds." Anna Maria at last died of a cold, and her place was supplied by a new female, whose chief peculiarity was that as soon as she had a family she would bite off her babies' heads."—[From Popular Miscellany, in Popular Science Monthly for September.

SONG OF THE ICHTHYOSAURUS.

[This curious specimen of German scientific humor refers to the close of the Jurassic (or Liassac) period and beginning of the Cretaceous, and describes the sad forebodings of a venerable Saurian, who sees in the degeneracy of the times a sign of the coming cataclysm.

The translator says, "Among the extraordinary liberties which we have been obliged to take with the letter of the original, in order to preserve as far as possible its spirit and its flowing movement, the most violent is the substitution in the last stanza but one, of an entirely new, (and poor) joke for the very neat but untranslatable jeu of the German. The last two lines of the stanza are:

'Sie kamen zu tief in die Kreide;
Da war es naturlich vorbei.'

The literal meaning is, 'They got too deep in the chalk, and it was, of course all up with them.' The allusion is to a score chalked up by a landlord against some bibulous but impecunious customers; and the notion that the saurians ran up so large an account for drinks that the chalk required to mark their indebtedness smothered the whole race, and brought on the Cretaceous or chalk period, is so absurdly funny that it is a pity to sacrifice it."]

There's a rustling in the rushes,
There's a flashing in the sea,
There's a tearful Ichthyosaurus
Swims hither mournfully!

He weeps o'er the modern corruption,
Compared with the good old times,
And don't know what is the matter
With the Upper Jura limes!

The hoary old Plesiosaurus
Does naught but quaff and roar;
And the Pterodactylus lately
Flew drunk to his own front door!

The Iguanodon of the period
  Grows worse with every stratum;
He kisses the Ichthyosaurusses
  Whenever he can get at 'em!

I feel a catastrophe coming;
  This epoch will soon be done,
And what will become of the Jura
  If such goings-on go on?

The groaning Ichthyosaurus
  Turns suddenly chalky pale;
He sighs from his streaming nostrils,
  He writhes with his dying tail!

In that self-same hour and minute
  Died the whole saurian stem,—
The fossil oil in their liquor
  Soon put an end to them!

And the poet found their story
  Which here he doth indite,
In the form of a petrified album-leaf
  Upon a coprolite!

—[Tidings from Nature.

THE PHILOSOPHY OF LONG LIFE.

In a very readable article on the philosophy of longevity, the London Standard says: "To make yourself miserable at 40 in the wretched ambition to add a few worthless years to your score after you have turned 70 or 80, is surely a poor-spirited sort of game. To spend one's life feeling one's pulse, looking at one's tongue, and asking one's self if one is treating one's constitution quite fairly, is not life at all. It is to live in a hospital, or at any rate, an infirmary. Still, there are some persons who are congenitally cautious, congenitally cold, congenitally calm. It is their nature to take things quietly, never to be in a hurry, never to excite themselves. They are content to sit in an easy chair for so many hours, read an agreeable book for so many hours, drive in a carriage when the weather is favorable for so many hours, and to regulate their existence by clockwork. They may live to 100, they may live to 1,000, but in truth they have not lived at all. The man who really gets the best that can be got out of life is the man who, with a fairly good constitution to begin with, is ready to squander it at any moment and on every occasion in a sufficient cause. He keeps no account of profit and loss with his vital energy; he sees work to do, and he does it; he sees pleasure to be enjoyed, and he enjoys it. He is alive all his life save when he sleeps; and he wakes from each fresh slumber looking cheerfully and encouragingly in the face, and ready and even eager to be a combatant when there is a good honest fight, and a runner when there is a good honorable race afoot. He may not live to be 100, but he may well live to be 70, 75, or even 80. He may have a career, if not so conspicuous, yet as active, as varied, and as restless as that, say, of Mr. Gladstone, and yet not be really old when time registers him among the aged. 'Better fifty years of Europe than a cycle of Cathay'; and better twenty years of uncalculated activity than the slow pulse and measured step of the circumspect snail that creeps slowly on to 100. We are not denouncing centenarians. They are like angels' visits, few and far between, and yet they are too rare not to be welcomed. Moreover, we doubt not that they deserve their length of years. But it would be a misfortune if it was ever thought an object of life to live very long. The object of life is to live, live generously, live bravely. As Shakespeare says, 'Ripeness is all.'"

OUTWITTING THE GHOST.

If primitive man knew how to bully, he also knew how to outwit the ghost. For example, a ghost can only find his way back to the house by the way by which he left it. This little weakness did not escape the vigilance of our ancestors, and they took their measures accordingly. The coffin was carried out of the house, not by the door, but by a hole made for the purpose in the wall, and this hole was carefully stopped up as soon as the body had passed through it; so that, when the ghost strolled quietly back from the grave, he found to his surprise that there was no thoroughfare. The credit of this ingenious device is shared equally by Greenlanders, Hottentots, Bechuanas, Samoieds, Ojibways, Algonquins, Laosians, Hindoos, Thibetans, Siamese, Chinese and Feejeeans. These special openings, or "doors of the dead," are still to be seen in a village near Amsterdam, and they were common in some towns of central Italy, as

Perugia and Assisi. A trace of the same custom survives in Thuringen, where it was thought that the ghost of a man who has been hanged will return to the house if the body be not taken out by a window instead of the door.

The Siamese, not content with carrying the dead man out by a special opening, endeavor to make assurance doubly sure by hurrying him three times round the house at full speed—a proceeding well calculated to bewilder the poor soul in the coffin.

The Araucanians adopt the plan of strewing ashes behind the coffin as it is being borne to the grave, in order that the ghost may not be able to find his way back.

The very general practice of closing the eyes of the dead appears to have originated with a similar object; it was a mode of blindfolding the dead, that he might not see the way by which he was carried to his last home.—[From "The Primitive Ghost and his Relations," by James G. Frazer, in Popular Science Monthly for September.

FRENCH WORKING PEOPLE.

The condition of the working people in France has steadily improved during the past seven years. Wages have increased from 10 to 40 cents, thus enabling laborers to live more comfortably. The effect of this is felt in more cheerful home life. Children enjoy a better education, and are not compelled to go to work until they reach the age of 12 or 13 years. The usual number of working hours is ten. The national habit of economy enables laborers to lay up a little money for old age.

The food of a French workingman consists of bread, wine, vegetables, and vegetable soup, with meat only at rare intervals. Breakfast is frequently a cup of black coffee and a piece of bread; dinner, soup made from salt pork and horseflesh or cheap beef and vegetables, and a portion of the meat with bread, and for supper, bread and meat left from dinner, with potatoes.

CURRENT LITERATURE.

NATURAL HISTORY.

The Standard Natural History. Edited by John Sterling Kingsley Vol. I., Lower Invertebrates. Vol. II., Crustacea and Insects. Boston, S. E. Cassino and Company, 1885. Kansas City, C. E. Hudson & Co.

It is with sincere pleasure that the Review calls attention to the two volumes described above. To those acquainted with the voluminous nature of the literature on the subject of Natural History, it might seem superogatory to add six additional volumes, imperial octavo, to it. But, while there is no lack of books and periodicals devoted to the investigation and classification of facts in zoological science, it is only just to say that there are few of these which treat of animated nature in a way that combines technical precision of statement and thoroughness, in all branches, with interest for the non-scientific reader. Indeed the most of the books on the subject, which pretend to a comprehensive character, are school text books and, like most books of this character, of very little interest to those who wish something more than a dry and cold catalogue of facts. The lack of such a book has been frequently commented on by writers, both in science and general literature, and the Natural History before us is the outcome of an attempt to meet the demand. That the attempt has been successful may be gathered from the praises bestowed upon it by eminent students. Professor Cope says: "In my opinion the Standard Natural History is the best popular work on zoology which has yet appeared. It has an exceptional advantage as the product of a corps of the best specialists that America affords, and is under the supervision of entirely competent editors." Professor Coues asserts "It will be by far the best thing extant," and Dr. Leidy, "I regard it in all respects the best and most reliable popular Natural History that has ever been published in our country."

The fact, alluded to by Professor Cope, that each department of zoological science will receive the attention of a specialist is worthy of note here. This branch of knowledge, like most others, has in our age assumed most formidable proportions. In the eighteenth century it was quite possible for the student to become versed in all that was known of the animal kingdom; but in our day the zoologist cannot hope for eminence if he diffuses his labors over the vast mass of facts that connect in one science the humblest protozoa with the highest man. Thus zoology is divided into several fields and by choosing some one of these as a specialty, the student can achieve results of great and permanent value to science. Taking advantage of this fact, the publishers of the work in question have secured some of the best specialists in this country and, putting together their work, present us with a result wonderfully complete, harmonious and interesting.

The plan of the work is philosophical. Beginning with the lowest forms of animal life, the method of treatment follows the gradual development of complexity of structure and function and increase of intellectual powers until it ends with man. In accordance with this plan the work is arranged in the following order: Lower Invertebrates; Anthropods; Lower Vertebrates; Birds; Mammals; The Races of Man. Each group, into which these subjects are divided, is made the topic of an article by some prominent naturalist who has paid especial attention to its investigation; and by this means the latest discoveries and inductions, as well as the old established opinions, are ably and thoroughly presented.

The contents of the volumes received may be generalized as follows:

Vol. I. Lower Invertebrates. This volume begins with a general introduction to the Animal Kingdom, defining the terms used, and showing the field of Zoology as a whole. Following this is taken up, in systematic order, those simple, microscopic forms known as Protozoa, and then the Sponges, Jelly-fishes, Sea Anemones, Corals, Worms, Mollusks, Star Fishes, and Sea Urchins. The various articles are prepared by Prof. W. K. Brooks, of the Johns Hopkins University; Prof. S. F. Clarke, of Williams College; Dr. J. W. Fewkes, of the Museum of Comparative Zoology; Mr. A. F. Gray, of Danvers, Mass.; Prof. C. E. Hamlin, of Harvard College; Prof. Alpheus Hyatt, Boston Society of Natural History; Prof. Romyn Hitchcock, of the National Museum; Prof. D. S. Kellicott, of Buffalo, N. Y.; Dr. C. S. Minot, of Harvard Medical College; Prof. A. S. Packard, Jr., of Brown University.

Vol. II. Crustacea and Insects. The whole group of Animals with jointed limbs, of which half a million species exist, occupy this volume. Here will be treated the Lobsters and Crabs, Spiders, Thousand-legged Worms, Dragon-Flies, Grasshoppers, Bugs, Beetles, Moths and Butterflies, Flies, Ants, Wasps, and Bees. Among those contributing to this volume we may mention Prof. E. A. Birge, of the University of Wisconsin; Prof. J. H. Comstock, of Cornell University; Dr. Geo. Dimmock, of Cambridge; Mr. Henry Edwards, of New York; Prof. C. H. Fernald, of the Maine College; Mr. J. H. Emerton, of the United States Fish Commission; Dr. Geo. H. Horn, of Philadelphia; Prof. J. S. Kingsley, of Boston; Prof. A. S. Packard, Jr., of Brown University; Prof. C. V. Riley, United States Entomologist; Dr. P. R. Uhler, of the Peabody Institute at Baltimore; Dr. S. W. Williston, of the Yale College, etc.

If the first two volumes indicate, with any degree of accuracy, the standard of excellence to be expected in future volumes they will leave nothing to be desired in either manner or matter. It is a credit to the American press to produce such sumptuous volumes and a greater credit to the American people that their culture and love for knowledge, makes such a venture remunerative.

Apropos of this subject it is well to remind those whose interest it is to direct the studies of youth that there is no branch of knowledge so fascinating to the young as natural history. The writer's first remembrances are tinged with impressions received from a ponderous illustrated volume entitled "Animated Nature"—a volume over which many happy and profitable hours were passed; and there is no doubt that many adults can recall a similar experience, The boy who acquires early a taste for such literature is not apt to go astray in his later reading. While poetry, fiction, Belle Lettres, have their uses in this direction, their content is drier, to the boy or girl, and, it must be confessed, they are conducive to but a barren culture. Upon leaving school, the youth is so seldom encouraged to pursue further the threads of science, to be found in the curriculum of his studies that he forgets what little he learned. If parents would make judicious selections when presenting books to their children,the disposition to get knowledge would soon acquire a desirable strength as well as a judicious character. A work like the above would be the most useful and acceptable Christmas or birthday present a parent could give a child.

The Kansas City firm interested in this work, Messrs. C. E. Hudson & Co., is a late addition to the business enterprises of this city. The members are young, energetic and enterprising and come well recommended from the east. They have entered into a general subscription business, carrying exclusively the best class of such books.

AMERICAN ART.

SELECTED ETCHINGS BY AMERICAN ARTISTS. H. F. Richter Publishing Company, Philadelphia. C. E. Hudson & Co., Kansas City.

This is a collection of superb etchings by noted American artists and far surpasses anything of the kind hitherto shown in this city. Only one hundred and fifty copies of this (the first) edition will be published, each of which will be numbered and signed by the artists. Buyers of expensive art works will be delighted with these etchings. Among the artists represented are the Morans (Peter and Thomas), Kruseman Van Elter, Henry Farrar, Samuel Coleman, etc.

It must be a pleasant reflection that Kansas City has a reputation for culture sufficient to bring such artistic productions into this market.

C. E. Hudson & Co. also handle some very fine medical works; especially on anatomical science.

MICROSCOPY.

THE MICROSCOPE IN BOTANY: A GUIDE FOR THE MICROSCOPICAL INVESTIGATION OF VEGETABLE SUBSTANCES. From the German of Dr. Julius Wilhelm Behrens. Translated and Edited by Rev. A. B. Harvey, A. M., assisted by R. H. Word, M. D., F. R. M. S. Illustrated with 13 plates and 153 cuts. Boston, S. E. Cassino & Company, 1885, pp 466. Price, $5.00.

The scope of this work is confined within very sensible limits. Generally it is thought necessary by writers on the microscope to prelude the practical portion of their works by treatises on optics, or on the special sciences to which it is applicable. But Dr. Behrens, a practical Microscopist himself, takes it for granted that his reader is acquainted with those branches of science which must be known before the microscope can be intelligently used; hence he expects the student to acquaint himself with the optical and histological branches of the subject before taking up his book. Such a reader will find this guide to the microscope, in the investigation of histological botany, not only useful but almost indispensible, especially so if he is an amateur or a beginner in the science.

The early chapters describe the microscopical apparatus and appliances necessary for satisfactory work with directions how to use them. Along with this part of the treatise is given full and intelligible directions for the preparation of specimens. Following are chapters on microchemistry, microscopical reagents and the microscopical investigation of vegetable substances. While all of these chapters contain, practically, a digest of our knowledge on the subjects treated, yet the last named is especially admirable and exhaustive; though, at the same time, its arrangement is so lucid and intelligent that it makes the student largely independent of the costly and, sometimes, unobtainable literature on this head. The book is not a mere compilation but embodies largely the results of original work. The American editors have performed their work well, though a disposition is manifested to over-crowd the text with praise of certain makers of apparatus and too frequent references to their address.

As to the style of presentation, too much cannot be said in its praise. It is a fair example of the lavish American method of printing books of this character.

HEGEL'S ÆSTHETICS. A CRITICAL EXPOSITION. By John Steinfort Kedney, S. T. D., etc. Chicago, S. C. Griggs & Company 1885, pp. 302. Price, $1.25.

This volume belongs to the series of German philosophical classics just alluded to. The treatise of which is an epitome, or abstract, constitutes one branch of the most difficult of all philosophies. It is true that Hegel approached occasionally the simplicity of Greek dialectics; but it is only just to say that the spirit of his philosophy is almost beyond the reach of western thought; it is so far removed from the inductive method which now dominates every field of inquiry. It is equally true that the study of any other German philosophy, except that of Schelling, gives little aid to the student in comprehending or appreciating Hegel. For these reasons the work of Dr. Kedney will prove useful to those who share the renewed interest which Americans seem to nourish toward metaphysical and physological studies. Hegel's conceptions of an absolute spirit in art, religion and philosophy; of the adventitiousness of natural beauty in distinction to the legitimacy of artistic beauty; of the intimate relations between art and religion and philosophy; are so closely allied to certain forms of contemporary thought that we may look for a revival of Hegelianism on novel grounds at no distant period.

Prof. Kedney preserves the content of Hegel's system with singular fidelity (for so compressed a digest) and his own comments and elucidations are always judicious and intelligible.

FICHTE'S SCIENCE OF KNOWLEDGE. A CRITICAL EXPOSITION. By Charles Carroll Everett, D. D., author of "The Science of Thought," etc. Chicago: S. C. Griggs & Company, 1884, pp. 287. Price, $1.25.

This book is one of a series of "German Philosophical Classics for English Readers and Students," now in process of publication by S. C. Griggs & Co.

Of all the philosophical systems which originated in, or took direction from, the study of Kant, none are worthy of a higher place in the history of modern thought than that of Fichte. It has exercised an important influence on the development of the naturalistic movement, incited by the Cartesian method and carried to such wondrous heights in the science of our day. But this, like all German philosophies, has been sealed to most readers by the difficulty of its terminology and its rather verbose statement. Dr. Everett has performed a great service to American readers by his lucid, yet brief, presentation of Wissenschaftslehre of Fichte. Like the former volumes of this series, the present one shows the works of competent scholarship and criticism in its preparation.

A STRANGE MANIA.

The Dancing Mania. By J. F.C. Hecker, M. D. No. 72 of the "Humboldt Library of Science." J. Fitzgerald, Publisher, 393 Pearl St., New York. Price, 15 cents, post free.

The Dancing Mania of the Middle Ages is one of the most curious episodes in the history of mankind, whole villages, towns, and communities being seized with an irresistible impulse to dance and leap about, and to wander up and down the whole of Europe, communicating their frenzy to the people wherever they wandered. The symptoms of this strange disorder, and the mad antics of its victims are vividly portrayed by the author from contemporary annals.

Other Publications.

Local Institutions of Maryland. By Lewis Wilhelm, Ph.D., etc., Baltimore. N. Murray, Pub. Agt., Johns Hopkins University, 1885.

Bulletin de la Societe Royale de Geographie D'Anvers. 8th Annee sociale, 1884–5. Anvers. Imprimerie Veuve de Bocker,-Rue Zirk, 35, 1885.

The Dancing Mania of the Middle Ages. By J. F. C. Hecker, M. D. Fr. by B. G. Babington, M. D. F. R. O., J. Fitzgerald, New York, 1885.

An Account of the Progress in Anthropology in the Year 1884. By Prof. Otis T. Mason. Washington: Government Printing Office. 1885.

Corrections of Thermometers. By Thomas Russell, Junior Professor, office of Chief Signal Officer: Washington City. Signal Office. 1885.

Bulletin of the Philosophical Society of Washington. Vol. VII. Washington, 1885.

Fourth Biennial Report of the Board of Directors of the Kansas State Historical Society. Presented to the society at its ninth annual meeting, held at Topeka, January 20, 1885. Topeka, T. D. Thacher, State Printer, 1885.

Report of the Professor of Agriculture, Kansas State Agricultural College. Experiments. 1884. Manhattan, Kansas: Printing Dept. State Agric. Coll., 1885.

Circulars of Information of the Bureau of Education. No. 2, 1885. Teachers' Institutes. Washington: Gov't. Printing Office, 1885.

PERIODICALS.

One never tires of praising the Magazine of American History, for it represents so much sterling merit and so little that appeals to the love of sensation, so prevalent in the world and so catered to by magazine makers. The September number is especially attractive. Aside from the illustrations, which comprise a steel portrait of General Grant, in military uniform and illustrations of old houses at Riverside Park, there is sufficient in the articles to interest the most blase magazine reader. Mrs. Lamb, the editor, furnishes an article on the "Historical Associations of General Grant's Resting Place," for which her past studies and achievements have fitted her. This is followed by "Washington's first Public Service" by J. T. Chapman, A. M., "Baltimore in 1861" by Maj. Gen. Jno. C. Robinson, "The Beginning of the Civil War in America." The Rebels taking the offensive," by Gen. Thos. Jordan, "Military Affairs in New York State in 1861;" by Gen. Meredith Reed. The other articles are 'Closing Days of LouisXIV"and"Tributes to Gen. 'Grant." Published at 30, Lafayette Place, New York.

The North American Review for September opens with a symposium on "Grant's Memorial: What shall it be?" wherein the subject is discussed from various standpoints, and by eminent representatives of culture and art. The same number of the review contains a consideration of the question "Shall our National Banking System be Abolished ?" by George F. Boutwell, F. J. Scott, S. Danna Horton, and Edward H. G. Clark. "Ouida" contributes an essay on "The Tendencies of English Fiction," and Elizabeth Stuart Phelps writes on"The Great Psychical Opportunity." Mr. French, late Sergeant at Arms, writes "Reminsciences of Famous Americans."

The Journal of the Franklin Institute for September, has for its initial paper, an article by John Sartain "On the Ancient Art of Painting in Encaustic," elegantly illustrated. The frontispiece, an illustration of this article, is a reproduction on steel of an exquisite specimen of ancient art in encaustic painting. It was discovered in the ruins of Hadrian's villa, and is supposed to represent Cleopatra receiving her death from the bite of an Asp. Another illustration is a reproduction of the "Muse of Cortona," an encaustic discovered by a farmer while plowing in a field near Cortona. Other articles are "On the New System of Telegraphy to and from Moving trains, by the use of Electric Induction," by P. H. Vander Weyde, M. D. "A lecture on Matter, including Radient Matter," by Alex. E. Otterbridge, Jr., etc.

The ever seasonable Popular Science Monthly is at hand for September and presents its usual attractive bill of fare. "The Relations of Railway Managers and Employees," by Dr. W. T. Bernard, is the first paper, which is very pertinent in the light of recent events in the west. Among other papers are "The present Aspect of Medical Education," by Wm. G. Thompson, M. D.; "Insect Fertilization of Flowers" by the eminent German botanist, Dr. Behrens; "Origin of Man and the other Vertebrates" by Prof. Cope; "The Fauna of the Sea-shore," by Prof. Mosely; "How Spelling Damages the Mind," by F. A. Fernald; "Recent Progress in Biology" by Prof. Lankister; "The Primitive Ghost and his Relations," by James G. Frazer, etc. The "Popular Miscellany", is full of interesting matter.

The August number of Mind in Nature completes the first half year of this unique and entertaining magazine, and fully sustains its reputation. This number has the inaugural address of Dr. A. Reeves Jackson, President for the Western Society of Psychical research. A resume of Mrs. Sidwick's report on Haunted Houses. A paper by Mrs. U. N. Gestefield on Common Sense versus Medicine; some interesting and curious mesmeric experiences by H. M. Hugunin; the continuation of Bishop Coxe's articles—this time on Mischances. Brief papers by Brof. J. D. Butler, A. N. Waterman, and Lillian Whiting. A poem on Secret Thoughts by Ella Wheeler-Wilcox, with the usual amount of editorial matter, reviews and selections.

The old and popular Van Nostrand's Engineering Magazine gives its subscribers an exceedingly readable number for September. "The Relative Value of Tidal and Upland Waters in Maintaining Rivers, Estuaries and Harbors," by W. R. Browne, M. A., M. Inst. C. E.; "A Sketch of Roman Building Construction," W. T. Oldreve; "Three Problems in River Physics," by Prof. J. B. Johnson (Wash. Univ., St Louis), are some of the papers.

The frontispiece of The Woman's Magazine for August is "Aurora" drinking from morning-glory cups. The idea is carried out in some verses on "The Flower that Named Itself." Part II, of Miss Francis E. Willard's "Story of the Pyramids," tells of climbing Cheop's Pyramid, the outlook from the top, and the "Singing of the Rock of Ages" in the empty tomb at its base. "The Closest Tie," a true story of life in lumbering regions presents a strong contrast of woman's work. Mrs. Emma P. Ewing discourses on "Coffee-Tea-Toast." This number closes the eighth volume.

Among the papers, in the American Naturalist for August, the following may be noted for special interest or excellence: "Notice of some Human Remains found near the City of Mexico" (Illustrated) by Mariono de la Barceno; two continued articles, "Evolution in the Negotiable Kingdom" (Illustrated) by Lester F. Ward and "The Relations of Mind and Matter," by Charles Morris; and "The Use of Copper by the Deleware Indians," by C. C. Abbott. Under "General Notes" an admirable record of the progress of science is presented each month, and it does not lose character in this number.

The August number of the American Meterological Journal, manifests the robust character of the knowledge this periodical is circulating. Meterologists are gaining ground in establishing their study as a true science, by means of which true prevision is possible. "A remarkable Hail Storm" by J. H. Stathem, and a "Seven Day Weather Period, with Cuts and Tables," by H. H. Clayton, are interesting and useful papers. The prediction of Mr. Clayton in this number as to August weather, has been fulfilled in this latitude with great fidelity.

Mr. Proctor's Magazine, Knowledge, for July is at hand, and it would be a surfeited reader, indeed, who could regard its table of contents without pleasure. It contains a very Salmagunda of matter, "from grave to gay, from lively to severe." Without being invidious, attention is called to the paper of William Curran (reprinted in the Review this month) on "Life in Death;" "Illusions of the Sense" by R. A. Proctor; "Photography and Medical Jurisprudence," by W. Mathews, etc.

The Journal of Science, (English), for August is an extremely interesting number. Oswald Dawson contributes a very trenchant, but ill-natured criticism of Mr. Darwin's Origin of Species. The author of Scientific Materialism contributes a paper on "Relations Between Spiritualism and Scicence." Other noteworthy papers are: "On the Chemical Action of Light," and "On the Problematical organisms of Ancient seas."

Uuder the management of the Danas the American Journal of Science has suffered no deterioration from the standard set by the Sillimans. The August number contains several articles of more than ordinary interest. Prof. J. D. Dana treats of the "Origin of Coral Reefs and Islands;" C. M. Shepard discusses the "Meteorite of Fomatlan, Jalisco, Mexico;" T. C. Mendenhall describes a "Defferential Resistance Thermometer," etc.

American Microscopical science has an able ally in the American Monthly Microscopical Journal, which is frst becoming indispensible to Microscopists. The August number is well filled with useful papers in this science, among which may be mentioned "A Practical Method of finding the Optical centre of an Objective and its Focal Length" (Illustrated), "Cleaning Marine Mud," "Measurement of Blood Corpuscles," etc.

The American Antiquarian and Oriental Journal (Quarterly) for July presents several very interesting features. Among the papers are "Ruins at Copan and Palenque," by L. P. Gratacap (Illustrated) notes by the editor; "Ancient Works on Iowa," by Prof. Thomas and "Native American Symbolism" by the editor. The usual departments are well filled with attractive matter.

The August number of Literary Life being the first number of volume IV, contains the first part of Joaquin Miller's great poem, "The Sword of the South." This poem, written in and for the South, he prophesies, will shake the rafters of heaven. It is for a juster appreciation of the true situation of the Southerner.

The Kansas City Medical Index for August contains some papers of a timely interest to the medical profession, such as "Cancer" and "The Theropeutics of Cocaine."

Science (weekly) is always welcome and we try to show a proper appreciation of its excellence by dipping our beak into its columns occasionally, as we do this month.

The American Inventor for August comes full of interest and news from the Patent Office. It is astonishing how multitudious American inventors are growing.

The Canadian Science Monthly gives us some original work in "Notes on the Birds of Manitoba," and "The Home of the Pitcher Plant," in the July number.

The Household for August comes full of good things for the housewife and the family.

Other publications received are The Fountain, for August, the Telegraphic Journal and Electric Review (weekly) English; the New York Electrical Review (weekly): the Engineering and Mining Journal (weekly); the Age of Steel (weekly); the California Architect for August; the Gardener's Monthly and Horticulturist for August; the Journal of Mycology for August; The Chemical News (weekly); Scandinavia for August; The Electrician and Electrical Enquirer for August; the Iron Trade Review (weekly); The Sugar Beet for August; Le Leehuologiste (weekly;) LeMoniteur du Commerce, (weekly;) Monthly Weather Review for June; The Spokesman of the Carriage and Harness Industries for August; Plain Talk for August; The Mining Review, weekly; The Progressive Age and Water-Gas Journal, for July; the Manufacturers and Builder for August; the Missouri School Journal, (weekly;) the New England School Journal, the Boston Journal of Commerce, (weekly,) etc.

A Magazine for the Library and Household.

THE KANSAS CITY REVIEW,

Devoted to Science, the Arts, Industry and Literature.

UPON entering its ninth volume the REVIEW desires to call attention to the new features introduced by the present management and to register a promise to not only continue these features but to introduce such others as experience and a close study of the popular taste may dictate. The REVIEW will hereafter be a high-class magazine in every respect,—except subscription price. The October and succeeding issues will be illustrated, and no paper will find place in its pages except such as have sufficient merit to be admitted into the most pretentious magazine.

Subscribers to whom the present number is sent will please remit the subscription price to January 1—*i. e.* one dollar.

The October number will contain, among others, the following original papers:

STONEHENGE AND AVEBURY (Illustrated). Prof. J. MacLean, the celebrated lecturer on Antiquarian subjects.

HISTORICAL SKETCH OF THE ARYAN TONGUES. Prof. L. Wiener.

HERBERT SPENCER'S ESSAY ON RELIGION—A CRITICISM. Nathan C. Kouns, author of *Arius the Libyan, Dorcas, Faustina, etc.*

THE CRADLE OF THE HUMAN RACE. Edwin Coombs (a review of Dr. Warren's book, "Paradise Found").

SONG NOTES OF THE PERIODICAL CICADA. Prof. C. V. Riley (Read before the A. A. A. S. at Ann Arbor).

LIFE IN UNCONSCIOUSNESS. Frederick Hartman.

A CHINESE COLUMBUS (*concluded*) etc., etc.

THE KANSAS CITY REVIEW

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All communications should be addressed to

WARREN WATSON,
1319 Broadway, Kansas City, Mo.

WORDS OF PRAISE

A considerable degree of pleasure was experienced a week or so ago when the REVIEW made its appearance in my mail. I had frequently expressed regret that its publication had been suspended—I feared it was a thing of the past. I enclose you a dollar to pay till New Year and hope it may *never die again*.

Yours etc., T. BERRY SMITH,
Professor of Chemistry, Pritchett Institute, Glasgow, Mo.

The KANSAS CITY REVIEW OF SCIENCE AND INDUSTRY has been changed to the more simple and appropriate KANSAS CITY REVIEW, T. S. Case, M. D., and Warren Watson, editors. It is a live exponent of the scientific and industrial interests of the West.—*Iron Trade Review.*

The publication of the KANSAS CITY REVIEW OF SCIENCE AND INDUSTRY has been resumed. The name has been abbreviated to the KANSAS CITY REVIEW, which is an improvement, as the former name was rather cumbersome. The first number of the new series, which is at hand, offers a very interesting, instructive and entertaining table of contents. The student, the scientist and the general reader will find much that is valuable in the contributions which make up the offerings of this number, which, we are informed, is but the forerunner of even better ones to follow. The names of Dr. Theo. S. Case and of Mr. Warren Watson as editors are a sufficient guarantee that the high standard of this magazine will be maintained. We commend it to all lovers of good literature and wish it unbounded success.—*Jefferson City Tribune.*

The September number of the KANSAS CITY REVIEW will be out this week. A glance at the well-filled pages of this off-spring of Western thought and enterprise must convince the most casual observer that it is decidedly the most entertaining number yet put to press. "The Beginnings of Language," "Early Stages of the Earth's Growth," "Death in Life," "A Chinese Columbus," "Wonderful Productions of the Ocean," "The French Academy," "A Fish Eating Plant," and "Our Consular Service," are among the most interesting of the articles. A meteriological report for August is given. The editorial department, unlike that in most magazines, is lively and spirited, each subject being handled in a fresh and attractive manner. Under head of "Scientific and Industrial notes," a whole volume of important and useful information is given. Those of the Sentinel readers who are not subscribers to this valuable periodical should become so, and while securing for themselves a valuable Western magazine, aid an enterprise that deserves their support.—*Independence Sentinel.*

We commend Col. Case for his determination to shorten the name of his instructive magazine to the KANSAS CITY REVIEW.—*Kansas City Times.*

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THE KANSAS CITY REVIEW.

OCTOBER, 1883.

Theo. S. Case, M. D., }
Warren Watson, } Editors.

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THE KANSAS CITY REVIEW,

DEVOTED TO

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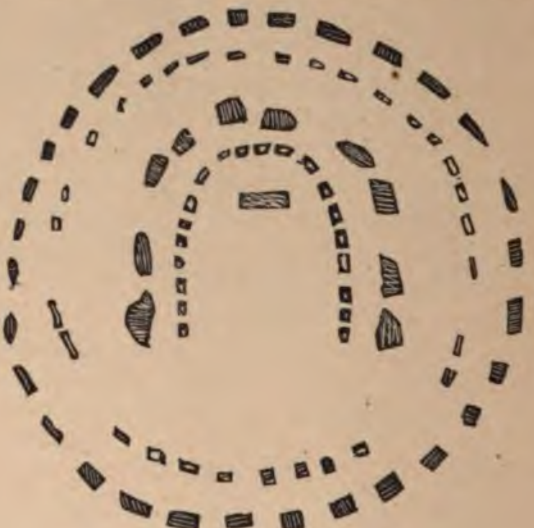
STONEHENGE AND AVEBURY.

Wiltshire, an inland county of England, contains the two greatest circular ruins of pre-historic times that may be found either in the British Isles or in Europe. Stonehenge, which has received the greater notoriety, is situated in the center of the plain of Salisbury. It is located two miles west of Amesbury, and seven north of Salisbury. The plain is an undulating chalky table-land, drained by the river Avon, and having an elevation of five hundred feet above the sea level.

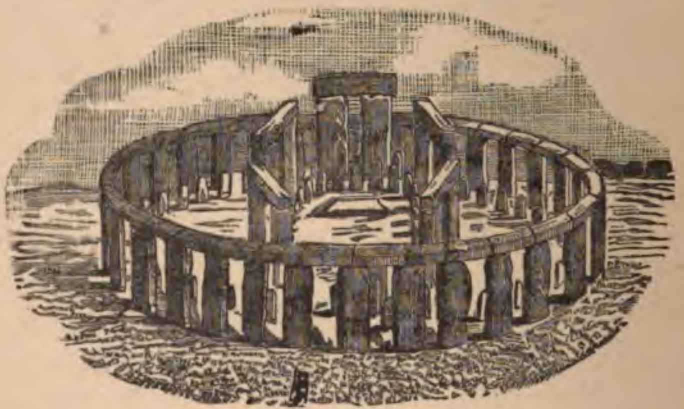
In the vicinity of Stonehenge are about four hundred tumuli, ten other ancient structures, the camp of Vespasian, camp of Clorus, the remains of two Roman roads, and the site of the Roman city Sarum.

In the early part of the present century Stonehenge was comparatively entire, but at the present time, appears to be little more than a confused mass of moss covered stones. A close inspection, however, enables one to trace out its original form. Originally it consisted of two concentric circles of upright stones which enclosed two ellipses, the whole surrounded by a circular embankment and ditch, the wall being fifteen feet high, and one thousand and ten feet in circumference. Exterior to the outside boundary was a single upright stone. To the north-east was an approach or avenue, bounded on either side by a wall and ditch.

The structure itself was composed of one hundred and forty blocks of erratic sandstone and boulders, weighing from ten to seventy tons each. Other stones of the same kind may be seen lying around the country, all of which appear to have come from the north of Scotland during the Glacial Age. The outer circle consisted of thirty stones fixed upright, three and one half feet apart and connected at the top by a continuous series of imposts, sixteen feet above ground. The stones composing this top layer were squared, rough-hewn and dovetailed together, and with mortise holes in their under sides for the reception of the tenon of the upright blocks. Seventeen of the stones of the outer circle still remain. The inner circle was removed a distance of nine feet from the



PLAN OF STONEHENGE.



STONEHENGE RESTORED.*

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*For this illustration and that of Avebury, we are indebted to Mr. E. A. Allen. They are taken from his "Pre-Historic World."

center, and also consisted of thirty unhewn granite pillars, bluish in color, varying from five to six feet in height. Eight still remain entire, with fragments of twelve more.

As may be seen from the illustration, which represents the work as restored, the most imposing part of the fabric consisted of the center ellipse within the circle, formed of ten blocks, in pairs, from sixteen to twenty-two feet in height, each pair furnished with an impost, and so arranged as to form five trilithons. Of these, eight still remain. Within this ellipse is the inner oval composed of twenty upright stones, similar in size to those of the inner circle, eleven of which are still standing.* In the cell thus formed and near the curve of the inner ellipse was the large slab of blue marble, called the sacrificial stone. Our illustration showing the ground plan will afford a good conception of the two circles and the two ellipses.

What was the object of this wonderful structure? when and by whom made? are questions which have been fully discussed, and must be of great interest to every student of his race. Any ancient structure, whose history has been lost, will have idle tales surrounding it, and plenty of theorists to put forth their ideas concerning its origin and use. Yet enough data generally remain by which its object may become known, and by whom erected. Clustering around the old ruins of Stonehenge is the legend entitled the "Dance of the Giants." It is first found in the "British Chronicle" of the tenth century, and repeated by Geoffrey, of Monmouth, and afterwards by Giraldus Cambrensis at the close of the twelfth century. The last named says: "There was in Ireland, in ancient times, a pile of stones worthy of admiration, called the Giant's Dance, because giants from the remotest parts of Africa brought them into Ireland, and in the plains of Kildare, not far from the castle of Naas, as well by force of art, as strength, miraculously set them up. These stones Aurelius Ambrosius, King of the Britons, procured Merlin by supernatural means to bring from Ireland into Britain." The story relates that Aurelius desired the structure in memory of the British cheiftains who were treacherously slain by Hengist and the Saxons, about the year 460. Aurelius was a Roman and was king of the Britons A. D. 481, which, according to account would fix the date towards the close of the fifth century.

It has been argued that Stonehenge is post Roman, not only because both Roman historians and geographers have failed to mention it, but also on account of the name itself. When these arguments are sifted it is shown that there is nothing in them. Because the Romans failed to mention the structure, that is no reason it did not then exist.

---

*A recent writer in Harper's Magazine December, 1884, says "Only the central circle and a few other stones remain.

One of the most important fortifications erected by the Romans while masters of England was the Caledonian Wall, [illegible] Roman historian makes any allusion to it. No Roman contemporary of Christ makes mention of him, yet that by no means proves that no such man as Jesus of Nazareth ever lived.

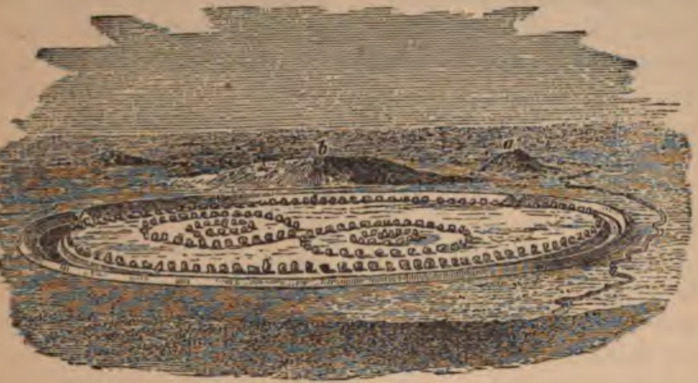
So far as the name itself is concerned, had we no other evidence, that would be a very strong argument in favor of a post Roman origin. As arguments, we cannot close our eyes to the fact, names must go a long ways. It is worth while to examine the names, for here we will undoubtedly obtain the sequel. Once the place was called *Stoneng*, and in the vicinity is still called *Stonege*. Its present name is Stonehenge, which is said to be Saxon, meaning, "hanging stones," or "Stones of Hengist," named for the mythical commander of the original Saxon invaders. Why should the Britons name this memorial structure after one who had murdered their chieftains? Perhaps a better etymology may be obtained. If the name by which the Kelts called this structure had not been departed from, no difficulty would have arisen in considering its origin and use. The great desire to throw aside purely Keltic names and adopt those of supposed Saxon origin has been a fruitful source of error. The original Kelts called Stonehenge *Coir mhor*. *Coir* means justice, right, equity (from this word we receive our English *court*, as applied to justice. From it the French obtain their *cour*, same application). *Mhor* means *great*. Hence the words in combination signify "The Great Court," or Great Court of Justice." At once this would make the ruins a druidical structure. This ancient priesthood were judges as well as members of the sacerdotal office. England was the principal seat of this order, and who knows, but at Stonehenge and Avebury the Arch-Druid presided in person.

After the Saxon and Danish invasions the Keltic Gaelic dialect; *Coir-mhor* was interpreted by the monastic writers into the Kymric (another dialect of the Keltic tongue) *choir-gawr* or *cawr*; and in turn from the Kymric into the Latin *chorea gigantum*, or the "dance of giants." A name so peculiar must have an origin. The monks, always equal to the occasion, invented the story of the giants who danced from Ireland, carrying on their backs the great stones with which to build the temple.

The name *coir-mhor* was applied to the stone circles of Ireland and Scotland; which would clearly indicate that they were used for judicial purposes. As they were erected by the priest-hood, they may also have taken a sacred character.

A structure erected after such a stupendous amount of labor must have been considered as a place of the utmost importance, and consequently needing protection from the intrusion of both enemies and the profane. Hence we find it guarded by a wide series of dykes or intrenchments. These ditches, or dykes, or intrenchments, the Britons called *staingeach*, *i. e.* abounding in dykes or intrenchments. *Staing* means an intrenchment; *staingich*, to intrench. Probably it is here where the Saxons derived the wild legend of "hanging stones," or "Stones of Hengist."

Sir John Lubbock assumes this structure to belong to the Bronze Age. Others following the same thought assume the outer circle to have belonged to the Iron Age, because the joints in the stone would require the use of iron. It is more than probable that work was continued on the structure until it was completed, and when completed only represented the original design. If it should be clearly proved that Stonehenge belongs to the Bronze period, that would not do away with its Druidical character, for the Druids may have passed from the Bronze into the Iron Age, and for aught we know, may have commenced in the Stone Age.



AVEBURY.

This ruin is located twenty-five miles north of Salisbury and six miles west by north of Marlborough. It is the largest ruin of its kind in Europe or the adjacent islands. It was first brought to notice by Dr. Stukeley, in the year 1740, although a manuscript account of it is still in existance, which was written by command of Charles II. in 1663. The work is located on a level area of four hundred and seven yards in diameter, bounded by a deep ditch and a high embankment. The circle consisted of a hundred large blocks of stone placed on end. Within this enclosure were two other circles, one of which, a double concentric circle, consisted of forty-three upright stones, with a single stone in the center; the other similar to it was composed of forty-five stones with three large and high blocks in the center. The embankment surrounding the temple had two gate-ways, one to the East and the other to the West, approached by avenues of a mile in length and varying from thirty-five to fifty-six feet in width. These avenues were accompanied with a range of blocks on either side. Near this structure is Silbury Hill one hundred and seventy feet in perpendicular height. This is the largest artificial mound in Great Britain.

Lubbock (*Pre-Historic Times*, page 53), gives a plan of this work.

HISTORY OF THE ARYAN LANGUAGES.

I.

Nations have carefully preserved legends and myths of their early existence and wanderings, from which an approximate idea of the continuous development from their infancy towards manhood can be evolved; but there is at the present state of philological research and knowledge, very little material available for the history of the childhood of Aryan speech. We accept, we feel, we are convinced that at an early time of the earth's age there was spoken by a large part of mankind a language which, for the want of a better name, we designate by the name of a race that more than any other is the inheritor of this ancient speech; and, probably, this language was once strictly confined to the Aryans, for, as Max Muller says: "Nations and languages were in ancient times almost synonymous; and what constitutes the ideal unity of a nation lies far more in the intellectual factors, in religion and language than in common descent and common blood."

We know not, cannot even conjecture, at what time the independent development of the separate families began.

About the thirty-first century before Christ one part of the race settled the country between the Indus and the Jumna and called it Arya Varta "the Land of the Just" (hence the name Aryan). The migratory Celt had gone to Minor Asia and the North of Africa; from thence over Gibralter to Gaul, and by another way, with great probability, over the Bosphorus to Italy. Another family came later by the Caspian Sea route and mixed with, or superseded, the Pelasgi, a Turanian race, in Greece and the Celts in Italy. Whether, under the influence of the Pelasgian and Celtic, the Aryan tongue yielded its original forms and developed itself into two distinct classes—the Greek and the Latin—or whether these latter were only slightly modified by the indigenous vocabulary—is hard to decide at present.

Meanwhile the Celts settled the British Islands where they kept their language for many centuries in unadulterated purity. The Slavs roamed over the vast Sarmatian plain and cultivated the soil wherever the conditions were favorable, while the Goths, or rather Teutons, occupied the middle and the northern part of Russia. The cognate tongue to the Slavonic, the Lithuanian, can be traced back no further than historical times when it established itself in western Russia.

The Rig Veda is the oldest document of Sanskrit; the Prakrit appears as early as the sixth century before Christ; since that time the literary language gives way to current idioms which at the present time have increased to several scores and retain their literary independence. The noblest of them all is the Urdu and its sister-dialect, the Ḥindi, which, if they have lost the pliability and metaphysical correctness of their worthy grandam, still charm the ear with their gorgeous dictions.

The holy books of the Parsis are documents of a language that highly resembles old Sanskrit; and proves, by the retention of the terms referring to the Soma worship, that its development began contemporaneously with the settlement of the country beyond the Indus by the Sanskrit speaking people. The sibilants of the Sanskrit are aspirates in Zend; the declensions in conjugations in both are nearly alike; of the few dialects that existed after the decay of Zend, Persian is foremost; Persian has shortened the endings, simplified the verb and amalgamated with the Arabian vocabulary; it is the language in which the Koil flutes—soft, rolling, from cadence to cadence, lulled by ingenious word reverberations.

From the testimony of early historians, and from the few inscriptions existing in Asia and Europe it is generally accepted that Gallatia in Minor Asia, Gallia of Cæsar, Gaedhel of the Irish, and Haldgastes of the Teutons are identical with Celt; it is also believed that the speech of the Gallatians, Gauls, and early inhabitants of Britain was identical, and that only after the settlement of the Gauls in the British Islands it separated into Irish and British. Of the Irish at the present three dialects are extant: the proper Irish, the Scotch Gaelic, and Manx; of the British also three: Kymragor Welsh, Armoric, and Cornish. Armoric stands in the same relation to Cornish as Gaelic to Irish, and Portuguese to Spanish. The Irish is nearer the original Celtic than the British, as it retains copious internal changes in declensions and conjugations which British has nearly all lost. The tip of the tongue pressed towards the teeth, being pre-eminent in the enunciation of the consonants, aspiration and ellipsis is often the result, which consists in softening the hard consonants and suppressing the harder before a softer one. If a language is to be judged by its best and most persistent productions I should call the Irish—the lyric language—very well adapted to wed Music to the immortal Muse. Following the mythical genealogy of the Greek people the Æolic dialect is the oldest, then came Doric, then Ionic; this fully agrees with what we can infer from the fragments of Æolian, Dorian and Ionian literatures. Æolic, with its prevalence of the *o* and *u* sound, though so well moulded into a language of passionate love by Sappho and the other Lesbians, has rarely been used for literary purposes. It was regarded as a barbarian dialect by the Athenians. The earnest Doric with its broad *a* was well calculated for choruses in tragedies and war-clamors. The luxurious Ionic abounded in soft *e* and admitted of various uses to the sensitive ear of the Greek author. The mean of Ionic and Doric, the Attic, began to set aside all other dialects in the middle of the fifth century B. C. and presents a most artistic and perfect structure of grammatical forms. Only little was it changed in Alexander's times who carried it to his conquered nations, nor was it changed later on by Alexandrian writers; even the Hellenistic Greek of the Septuagint and the Byzantine Greek of the middle ages have merely added some barbarian words, and neglected established grammatical rules, rather than brought in new forms. The modern Greek, of which examples are to be found as early as the sixteenth century, in its literary and conversational form as used by the educated classes, is ancient Attic made easy; the language of the vulgar deviates from it only in a motley collection and incorporation of Roumanian, Slavonic and Turkish words into its vocabulary.

Not so happily has fared the Latin, the conqueror of the world and the master over educated minds in Europe as late as the eighteenth century. Among the Umbrian, Oscan and other dialects, Latin can be studied in its archaic form on sundry inscriptions and in ancient imprecations; it became soon the language of the subtle lawyer and the daring warrior and was in the flower of grammatical and rhetorical development in the Augustan age; a fine satire pervaded it; the people spoke it; the soldiers and conquered nations used it in Spain, in England, in France, in the Alps, on the Danube. Rome fell, and the Latin language with it; after this it led a precarious existence in the Catholic church and in sequestered cloisters up to the latter part of the middle ages and at this period very justly deserves the name of Kitchen Latin.

In the thirteenth century the Italian people began to cherish a patriotism for the vulgar tongue which was far softer than the original Latin. About that time the Spanish dialect, influenced by Gothic and Arabian, brought forth its full-sounding, silver-clanging, chivalrous Castilian in ballads and romances; then borrowing some from the French and some from the English it sent off a shoot as Portuguese. The French itself—a hashed, barbarous Latin in the ninth century—began to acquire rounded shape, and to vie in elegance with its older sister, the love-singing

Provencal. Only very lately did the Roumanian spring into a written existence, a remnant of rustic Latin, seasoned with a Slavonic vocabulary. A few other waifs are to be found within the Alps.

Hardly any family is so well provided with a numerous and strongly resembling posterity as is the Slavonic. In earliest times we hear already of Polish, Bohemian and Bulgarian. From their inter-marriage arose those numberless Slavonian, Slavac, Croatian, Ruthenian, Carpathian and other dialects. The Bulgarian was a harsh, complicated language, and in the ninth century of the national existence of the Slavs it became the church language of the Greek Catholic Slavs. This was superseded later by the New Bulgarian, an easier and more fluent speech. The influence of Bulgarian on the native dialects was very great; with the Muscovitish it gave the elegant literary Russian language as early as the sixteenth century; side by side with it went the development of the Little Russian and Servian, Bulgarian and others. The Polish gave no literary off-shoots; it is more plastic than the Russian, more sensitive to consonant changes, and has more nearly retained the nasal sounds of the Old Slavonic. The Bohemian in its form is nearer the Russian than the Polish, has broad vowels and is spoken from the chest. As all of the Slavonic languages stand closer together than French and Spanish and the other Romance languages, it has been a dream of the Panslavist to create one common literary language for all: a dream, and a fair dream it is! Were it not for the Lettish, a child of the Lithuanian, which possesses lyric poetry and a remnant of an epic poem, and is spoken by, probably, half a million of men, the Lithuanian would hardly be noticed; still on account of its peculiar structure, in which it resembles the Sanskrit, it is a valuable factor in philological research and will help some day to elucidate the history of the Aryan tongue.

In the fifth century the Goths appeared in Europe; but Teutons there had been before in the woods of Germany; it is yet a disputed question whether the Gothic should be regarded as the prototype of Teutonic or as a separate branch of the same family. The Teutonic is divided into the Eastern—the Scandinavian class—and the Western, which again is sub-divided into (1) Frisian, Saxon; (2) Frankish, Hessian, Thuringian; (3) Allemannian, Bavarian. The Old Scandinavian in its almost ancient purity is still spoken and written by the Icelanders; while in a more developed state it has become the language of the Swedes. The Norman pirate was seldom at home and with his booty brought back German and French influences, and in course of time the Swedish language, shaded with a German construction and phraseology had found it necessary to form a literary language of its own—the Dano-Norwegian tongue.

The Frisian and Saxon gave the Nieder-deutsch, the Frankish, Hessian, and Thuringian, the Mittel-deutsch and the Alemannian and Bavarian the Ober-deutsch. The Mittel-deutsch went through the successive changes of Alt-hoch-deutsch, Mittel-hoch-deutsch and Neu-hoch-deutsch, in which form it is the literary mean of the savant and the vernacular of the educated classes. The Frisian and Saxon in the neighborhood of Celt and Briton, and under the influence of Norman and Norman-French, has become the English language.

The English language has broken down all walls and avenues in its grammar, mutilated the bodies of words and left only the trunks of them; it has a code of vowels and consonants which are pre-eminently adapted for "spitting, and spluttering," or as some say, to be chirped by sparrows—and still it is the most wonderful in the labyrinth of the Aryan tongues. It has more people under its sway than any other, and has produced a variety of literature such as no other on earth can show. It has ransacked all recesses of human knowledge and feelings, and by dint of its terse and energetic character become the foremost of them all. What its position in the future will be is hard to say; let us hope that it will add much to the unification of the present Babel of tongues and reduce them to a number of worthy representatives of the Aryan speech.

II.

I have given a succinct history of the Aryan languages, as they appear on the scene of Aryan countries to the historical, or scientific, student in their life, development and ramifications, and shown how they were succeeded by their more intense vernaculars, in endless variety in Europe, Asia, and America. We can from the vast material of literary languages re-construct with an exactness befitting my purpose the original Aryan; now my purpose is to follow up the tendencies of the languages to differ from their mother-tongue, to explain the course they have been taking, and to forecast the probable future of these languages; what historian is so deliberate and cold-blooded as to leave out his favorite idea about the destiny of the people, the state, the science, whose vicissitudes he is delineating?

The organic part of the language is the action word, the noun, the pronoun and the structure of the sentence, and it is here that we are mainly to look for the degree of relationship between the different languages and their connection with the Aryan.

The action-word in Aryan was composed of the uninflected part (which for shortness sake I shall denote by the term *verb*) and the pronominal ending. A rudiment of a past and future tense, and also of a conditional mood existed, but these were not stable enough to influence alike, permanently, the various descendants. Thus many languages had to form their tenses themselves. The past was composed of the verb, the word corresponding with *have* and the pronominal ending; the future was less certain and coalesced either with *have* or with *be*. The pronominal endings lost their independent meaning, and were regarded as necessary appendices to the action-word. The past tense, not being sufficiently well established, the Aryans stressed the main part of the verb, as little children do when they refer to events recently or long since past. This is all we can say with certainty about the Aryan action-word. Let us look now to the respective construction of the action-word in early languages.

The last part of *luomen*, *amamus*, *buailmid*, is physiologically the same; even such apparently diverging endings as in *henti*, *amant*, *luousi*, *buailed*, are identical, every one accepting a different shape under the influence of phonetic laws. Reduplication in the past tenses of some languages and internal change in others, are what I have denominated as *stress* in Aryan. The Greek *lĕlukasi* equals *stress* plus *verb*, *ex* plus *si*; *amavit* equals *am* plus *hab* plus *it*. The development of the future belongs separately to every family. Later on, the tenses became more and more conventional. The original composition was lost sight of entirely; pronouns were being added in the beginning; and still later, as in the case of the Romance, the corrupted old forms are being pushed out by original compositions, analogous to the primary building up of the Aryan.

Torceaun, in his Roumanian grammar, after enumerating the Imperfect, Perfect, and Pluperfect Simple and giving their paradigms, says:

"These perfect and pluperfect tenses are *frequently* used in narration, whereas in conversation in speaking of past time the following compound perfect is used: *eu am arat* 'I have ploughed.' Analagous compounds are: *Ich habe geschrieben*, *Oeilo Bailei*, I shall throw.

Grammatically and, may be, also logically the Aryans conceived the adjective, the pronoun and the substantive as existences, as objects; declension acquired shape before the distribution of the families and was the result of a loss of meaning of specifics, particles and prepositions which were added to the word to form the needed relation. The oldest languages have so many things in common in the formation of feminines, and in declensions, that there is no doubt of the common derivation of their forms from the mother-tongue. The tendancy of the old languages to make *a* prominent in the feminine and *m*, or a nasal *n*, or a vowel in the accusative, press through in the most of the modern languages. In course of time the ease-endings became fewer and fewer until they disappeared in the most, so that prepositions had to be put in front of the word to be affected. Instead of *amici* we have *del amigo*, instead of *godrar* and *godri* and *godum* we have *of the man, to the man, from the man, with the man,* and this shows that English has lost all respect for and sense of the rich nomenclature of Aryan grammar. The order of the sentence in Aryan seems to have been originally the inverted, that is, the verb was followed by its defining subject, the attribute followed the noun and the participle defining the relation stood after them. But not long previous to the distribution of the Aryan languages, when the cumbersome grammatical structure demanded greater freedom, the order in the sentence may have been promiscuous. In the most modern languages the order is direct and begins with the subject and ends with the object.

Thus we see that from a comparatively simple construction the Aryan tongue was modified to complex grammars in the classical languages; these were going up hill, until reaching the summit, a descent on the other side began. The languages are moulding themselves back into simple shapes with auxiliary verbs to express tenses, with pronouns to indicate persons, with prepositions to form relations. What will be the end of it? When the languages will have simplified so as to have reached the nearest possible approach to early Aryan form, there will be a struggle between them until the more powerful, the one which is spoken by a greater populace, will substitute the weaker, and then a few new centers will be formed for the development of those few families.

We see how in America the English language is undermining and exterminating the other Teutonic languages; the contact of the English with the German, the Danish, the Dutch, has been ominous to the latter. Where are the Knickerbockers of New York, the Swedes of Delaware? The Spanish has substituted the finer but more complicated Indian languages of the Mexicans and the Peruvians and only meets resistance from the indomitable Maya. The English has crowded out the Spanish of the Pacific coast, and before long New Mexico and Arizona will be Spanish only in tradition.

The war has begun, and the simplest language, the most adapted to every day wants, will some day remain the only important inheritor of the legacy of a people that founded *Arya Varta*, the land of the just.

HERBERT SPENCER'S ESSAY ON RELIGION.*

It was mere intellectual error which led Augustine and Calvin to begin by applying the physical law of Causality to the moral nature of man, and to end by defining the divine Predestination as *Decretum Horribile*,—which represents God as a tyrant who arbitrarily ordains both sin and its punishment and Righteousness and its reward; and is utterly oblivious of the simple truth

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*RELIGION: A RETROSPECT AND PROSPECT. By Herbert Spencer.

> "That God's first use of Sovereignty
> Hath been to make our fellow-men
> With all his own vast freedom Free."

For they strove to bind the moral nature by a law which pertains only to the physical universe, and which ceases to exist in the presence of Will, human or divine, just as Gravitation, Chemical Affinity, or any other so-called "Natural Laws" might cease, or reverse, their action if material things were once endowed with Will: so that water might will to flow "up stream," and solid bodies might will to fall from, rather than towards the center of the earth.

This ancient intellectual error has been repeated, in a far more pitiable and inexcusable form, by Mr. Herbert Spencer in a careful essay entitled "Religion: A Retrospect and Prospect," which appeared in *The Nineteenth Century* for January 1884, and was republished in *The Popular Science Monthly*. For Mr. Spencer, who is one of the chief apostles of the atheistic creed of Agnosticism, (like all his tribe) seeks to bind moral or spiritual truths by physical laws; a process as utterly unscientific as would be the attempt to determine the fauna and flora of any designated region by an examination of the religious notions of its inhabitants.

In the article named he first assumes the absolute verity of the physical law of Evolution, assumes that this law is as applicable to religious conceptions as to material existences, and next assumes that the facts manifested in the course of the "development" of Religion demonstrate the evolution of our Theism from an exceedingly thin and intangible protoplasm of ghostism, as the following quotations show: "How do these ideas concerning the supernatural evolve out of ideas concerning the natural? The transition cannot be sudden; and an account of the genesis of religion must begin by describing the steps through which the transition takes place.

"The ghost-theory exhibits these steps quite clearly. We are shown by it that the mental differentiation of invisible and intangible beings from visible and tangible beings progresses slowly and unobtrusively. In the fact that the other-self, supposed to wander in dreams, is believed to have actually done and seen whatever was dreamed—in the fact that the other-self when going away at death, but expected presently to return, is conceived as a double, equally material with the original: we see that the supernatural agent in its primitive form diverges very little from the natural agent—is simply the original man with some added powers of going about secretly and doing good or evil. And the fact that when the double of the dead man ceases to be dreamed about by those who knew him, his non-appearance in dreams is held to imply that he is finally dead, shows that these earliest supernatural agents are conceived as having but a temporary existence: *the first tendencies to a permanent consciousness of the supernatural prove abortive.*

"In many cases no higher differentiation is reached. * * * Thus the Unkulunkulu, or old-old one, of the Zulus, the father of the race, is regarded as finally or completely dead. * * * But with habitual wars, * * * with the compoundings of small societies into greater ones, * * * with the multiplying gradations of power among living men, arises the conception of multiplying gradations of power among their ghosts. Thus in course of time are formed the conceptions of the great ghosts or gods, the more numerous secondary ghosts or demigods, and so on downwards—a Pantheon: there being still, however, no essential distinction of kind: as we see in the calling of ordinary ghosts *manas*-gods by the Romans and *elohim* by the Hebrews. * * * With advancing civilization the divergence of the supernatural being from the natural being becomes more decided. There is nothing to check the gradual de-materialization of the ghost and of the god; and this dematerialization is invisibly furthered in the effort to reach consistent ideas of supernatural action: the god ceases to be tangible, and later he ceases to be visible or tangible. Along with this differentiation of physical attributes from those of humanity, there goes on more slowly the differentiation of mental attributes, until the harsher features are differentiated out of existence, and "divine love, divine forgiveness, divine mercy, are now the characteristics enlarged upon."

After tracing the supposititious influences of the law of Evolution through all the anthropomorphic conceptions of Deity, and assuming that the law applies to God, (as well as to man's notions of him) the philosopher continues: "Thus recognizing the fact that in the primitive human mind *there exists neither religious idea nor religious sentiment*, we find that in the course of social evolution and the evolution of intelligence accompanying it, there are generated both the ideas and sentiments which we distinguish as religious: and that *through a process of causation clearly traceable, they traverse those stages which have brought them, among civilized races, to this present form.*"

This is perhaps the highest and most recent utterance of agnosticism in regard to God; and it gives us not even a Zulu-land "Unkulunkulu" to worship: and this is just what human philosophy naturally "differentiates" by the application of physical laws to moral questions.

It must be palpable that this attempt to evolve the idea of God from "the Ghost theory," rests primarily and confessedly on the assumption that "man" was once such a hopeless idiot as to believe that he had "actually done and seen whatever was dreamed": *i. e.* that man did not know that he might dream when he was sleeping, and, therefore, believed his dreams to be veritable facts "done and seen."

The basis of the whole thing is false in fact: for there never was a time when man did not have sense enough to know when he had been dreaming. Nor is it any more true in fact that mankind ever believed that each individual had an "other-self" that "when going away at death, but expected presently to return, is conceived as a double equally material with the original." The Zulus may have had some such notion, as they are very "agnostic" tribes; but mankind never did. If it were true that man possessed this "double," or believed that he possessed it, Mr. Spencer did not know "the fact that when the double of the dead man ceases to be dreamed about by those who knew him, he is finally dead"; for while many a man has justly believed that his spirit survives the death of his body, and that his own and the spirits of other men might "return" (as many beyond any sort of reasonable doubt have done), the only reason for his "non-appearance in dreams" may be the fact that the separated spirit may have passed into conditions which render it impossible or unpleasant for it "to return"; —it may have acquired "a spiritual body," or it may have finally abandoned the hope of doing so; and in either case, might voluntarily, or compulsorily, have severed all connections with men "in the flesh." For it is abolutely certain that the first necessary work of a Soul (Life, *Psyke*) when quickened by conjunction with a Spirit (*Pneuma*) is to begin the work of erecting a natural body for itself and its conjoined spirit, as it does in the womb by the assimilation of natural aliment, primarily from the blood of the mother, under conditions of which we know something; and we may be very sure that the same soul separated from the body will seek to create a spiritual form for itself and its conjoined spirit by the assimilation of spiritual aliment, of which we know little, under conditions of which we know even less. And these conjectures are certainly as reasonable and "scientific" as any which Mr. Spencer has suggested. For what authority is there for declaring that a belief in ghosts, based upon the alleged fact that men were once so silly as to have believed themselves "to have actually done and seen whatever was dreamed," gave rise to faith in immortality, and finally to faith in one great Immortal, rather than to say that a prior belief in immortality gave rise to a belief in ghosts? Is it more easy to conceive that man believed in ghosts because they first believed that spirits which had left the body had visibly returned, or because having a prior belief in the immortality of the spirit, they thought it natural that the separated spirit would revisit formerly well known scenes? However this may be, it is not probable that belief in ghosts originated in the impossible fact that man believed in dreams as true; and perhaps we would come nearer the truth by declaring that both faiths would have been impossible to man, unless the facts existed, to-wit, that the spirit survives the body, and that it sometimes "returns"; otherwise there is nothing from which the belief could be "evolved."

It is thus made plain that the doctrine of evolution is incompetent to account for belief in the supernatural without falsely assuming it to be true that man is silly enough to receive as a fact that the "other-self" *is* "supposed to wander in dreams" and "*is* believed to have actually done and seen whatever was dreamed:" and equally plain that when Mr. Spencer asks "How do these ideas concerning the supernatural evolve out of ideas concerning the natural"? the answer ought to be that they do not so "evolve" at all, and are ideas that are in the very essence of them of an entirely different kind, and that came from another sphere of ideas altogether. For not only is it true that the attempt to apply the physical law of evolution to God (or even to anthropomorphic conceptions of him) is a mere intellectual abortion such as Augustine and Calvin perpetrated in their efforts to subject the moral nature to the law of Causality, but it belies the history of the human race.

Let us examine this assertion briefly.

The Agnostics denominate God "the Unknowable," "the Unthinkable," and by other appellations designed to express the idea that the thing spoken of is utterly beyond the range of human thought: "an Ultimate Reality transcending human thought." So far as our mere intelligence is concerned, the agnostics are unquestionably right. Jesus Christ expressed and repeatedly taught that God is "Unknowable, Unthinkable" to human intelligence; and that his personal existence would have been a blank to us forever if He had not chosen to reveal Himself to man; but the assumption of the agnostics (however essential to the statements of their atheistic creed) that our present conceptions of Deity are only the evolution or development of primitive crude notions on the subject, *is utterly false in fact:* for the simple fact is that the original faith of the primitive races of mankind was an absolutely true Theism, of which the Athanasian creed itself is a mere perversion; so that, the original Faith, more perfect at the genesis of it than it generally is today, must have been a Divine Revelation and not an "evolution" or "development" of anything whatever. It seems to be a thing utterly impertinent to the purpose to cite the idolatrous notions of comparatively modern nations like the Greek, Romans and Zulus (with Unkulunkulu at their head) upon such a question, for it must be well known that Egypt was wrinkled with age, and that the Israelites, the Chinese, and the Indians, were each "a people" centuries before these modern nations existed; and he might equally well know that the original faith of these primitive races was a pure Theism—faith in one dual God, a double Being, self-existent, that was sometime to become manifested to mankind by the generation and incarnation of a son; and that this primitive, pure Theism preceded all forms of polytheism by countless centuries; and that idolatry became possible only by the degradation of the original faith.

This primitive faith was expressed in China by the double-name Chang-Eng; and after the Chinese had vainly waited for centuries for the earthly manifestation of the one dual Deity, and faith began to fail, they first, perhaps, degraded the original Theism by considering the Igneous and Aqueous principles of nature to be the source and origin of all things, and then learned to believe that Man himself was the earthly manifestation of God, and, hence, they began to pay divine honors to their ancestors, and to "pot" and worship the bones of their fathers, a fact that is inexplicable except on the supposition that they believed Man to be the earthly manifestation.

So in India the original faith in one dual Being self-existent, as set forth in the earliest Rig-veda, was expressed by the double name Indra-Agni, and as faith began to decline they construed the divine names to signify Solar light and vapor, and began to believe that Buddha was the earthly manifestation of the one Supreme God; and afterwards Vishnoo, Siva, Brahm, and countless other mythical deities intruded into the darkened world of faith.

So, and more clearly, in Egypt the revealed name of God was Ra, and his consort, the feminine element of the Dual Being self-existent, was a female Ra, and never any created being, but essentially one with himself, consubstantial, *omoouuios;* and this one dual, double-sexed deity was to be made manifest to man by the generation of a Son, and his birth into the world. When the coming of this divine Son had been long delayed, and faith in the original Revelation grew wavering, the priests began to search for him through earth and heaven. The original conception of the Ra-ra God and a promised but unknown and nameless Son, degenerated into the mere myth of Hesiri-Hes (which Herodotus introduced to the Greeks as Osiris-Isis) and a Son called Horus. Yet it seems to be true that the priests long regarded Hesiri-Hes and Horus as a myth only, and as symbolical of God and his Son; and it undoubtedly is true that while the Egyptians worshipped God by different names at different times and places, they always carefully maintained the essential idea of a dual God made a Triad by the generation and birth of a Son. The primitive formula of faith was the Ra-ra, dual God, and an unknown Son: after that the myth of Hesiri Hes Horus: then the transformation of this myth by belief in it as a fact instead of as a symbol: then the giving of other names to the same Triad in other temples: then as the degradation of the religious idea proceeded, the idolatrous notion that the Son whom they had vainly awaited in the form of man, might come into the world as a sacred brute: then the deification of the sacred Bull Apis, and even of inanimate things as the Nile. The word Hapi which was applied to the bull-god and to the Nile, in the Hieratic speech of Egypt signifies "the Hidden," the Concealed," and undoubiedly meant to embody their priestly knowledge that the son whose manifestation was to make a Triad of the Ra-ra God, was yet "hidden," "concealed," like the undiscovered sources of the Nile and like the Divinity whom they vainly hoped some Apis might beget.

These facts and others of equal significance, leave no doubt that the original faith of the primitive races was a pure Theism, and that the polytheistic and idolatrous notions out of which he seeks to "evolve" the idea of the supernatural, was the degradation of the faith which was revealed in perfect strength and purity, and never evolved out of anything human or earthly, even as Paul said to twenty centuries ago.

[TO BE CONTINUED.]

LIFE IN UNCONSCIOUSNESS.

It is not intended to examine in this paper the metaphysical doctrines of any school of philosophy, however suggestive the title may be of teleological speculations. The era for mental gymnastics, for subjective ratiocination, is fast passing away; and marvellous as the speculations of metaphysicians may be in the laudable effort to discover a First Cause, we find now so much in the phenomenal world to engage attention that there is little to attract truth-seekers into fields beyond experience. Having assured us that there is a First Cause and that it is Infinite and Absolute, Philosophy should rest on its laurels without destroying its own edifice by attempting to define Infinity and limit Absolute Being. The old fashioned lines of Pope are applicable here:

> "Presume not God to scan;
> The proper study of mankind is man."

The subject to be discussed in this paper has been pressed on my attention from many directions and through very diverse phenomena. The facts which gave it birth are many of them old and well known even to the popular apprehension. Those that possess any novelty are attested by the universal voice of science and are no longer occult, even to the casual enquirer. That my use of these facts may be clumsy and inadequate I do not doubt; but that in the hands of a master, such as may arise hereafter, they will serve to rationalize much of life's mysteries that still vibrate to superstitious chords and remove a thousand obstructions to man's progress from animalism to the pure heights of reason and intellectual life, I firmly believe.

In the evolution of life there is a progress in two directions: (1) toward a specialization of physical functions and (2) toward the automatic action of these functions. Without the first the second could not exist, and *vice versa*.

A great writer, Thomas Carlyle, in a well known book finely says that man's "collective stock of Handcrafts, the whole faculty he has acquired of manipulating nature—all these things, as indispensable and priceless as they are, cannot in any way be fixed under lock and key, but must flit, spirit-like, on impalpable vehicles from father to son: if you demand sight of them they are nowhere to be met with." Here is a shadowy perception of the fact that all craft—all use of function—all expenditure of force—are gravitating toward automatism. The "stock of handicraft" which seems so mysteriously transmitted from one generation to another we now know is simply the stored up training of the race; training which in time becomes as purely automatic in its manifestations as the beating of the heart or the motions of the diaphragm. It is a recognition of the truth, which cannot be stated too broadly, that the higher life must be the result of organization,—the consequence of the acquisition, not of of new faculties or senses or functions, but of the power to so exercise those we now possess that their use will not be slow and painful. In modern books we read constantly of "organized memory." This expression has become a sort of new abracadabra which is lugged in to explain every dfficulty in the path of the student. If it is asked how is it that I write the words upon this page without conscious reference to the letters that compose them? the answer would be, "organized memory." If a musician, thoroughly acquainted with his instrument, should curiously ask how it is he can, without conscious volition, strike the right note in the dark, or play a difficult piece at first sight, the answer is, "organized memory," That organized memory exists is part of my proposition and memory when it becomes organized must be exercised unconsciously. But all expertness cannot be explained by this principle. In the labor of writing many things join together to produce the result. Because we do not have to consider how a word is formed in order to write it, is not a reason for saying that the letters are unconsciously in our memory. I don't believe they are. I believe that, having learned how to form a word, that word becomes a fundamental acquisition which the operations of the mind give off at the end of the pen just as though an automaton held it and the impulse was a crank and a [illegible] a constant and progressive [illegible] of the Will so far as the [illegible] of its growth are concerned. [illegible] by a very slow and laborious path a stage which the man of the future will stand upon at birth.

And this brings me to the last point of my topic: Is the abnegation of Will a step to higher intellection? I believe it is. So long as an effort of will is required to direct the operations of the mind or body there must be difficulty, imperfection, delay. Once educated to perform its offices without conscious interruption, the brain will operate as automatically and certainly along purely mental lines as it now does in directing the sympathetic nervous system. Not that this abnegation of the Will can ever be real: it will be advanced to more gigantic offices. It will no longer attend to the minutiæ of things. Here and there it will set a thousand wheels in motion; and, like a god, wait for the result. The Man that I see springing from the long train of evolutionary processes will need no formal logic, no machinery of ratiocination. He will not need to be taught the multiplication table; he will not need to constantly waste life by verifying knowledge. Instead of having the body dominate over the intellect the mind will dominate over the body; but over all, as the *deus ex machina*, a gigantic and imperturbable Will shall direct the course, though it may not restrain or accellerate the operations of the mind and body. Thus consciousness will be confined to purely supraphysical regions. Existence, as we now know it, will become unconscious and above and beyond the sphere of present existence, man will discover and occupy a new world more wonderful and more unexpected than that which gratified the eyes of a Columbus.

HYPNOTISM.

Hypnotism, or mesmerism, up to the present time, seems to have been looked upon as a scientific curiosity rather than as a legitimate subject for scientific investigation. The obscurity lingering around its anatomical basis, or, rather the pathological changes causing it, is such that it is extremely difficult to give a rational account of its phenomena. We can know nothing of the mystery called mind apart from its connection with matter. That it is a secretion of the brain, in the sense that bile is a secretion of the liver, or mucus a secretion of a membrane, is not yet proved, and the analogy does not hold fairly good; for bile and mucus are substances which we can analyze, whereas thought is intangible. Yet for every change in the current of thought we are forced to conclude that there is some change in the instrument thinking. These changes can be produced in many ways. They can come from direct injury, from chemical action, from derangements of nutrition affecting the quality of the blood, from increase or diminution of the blood supply, from long continued over exertion. It is easy to see that if any part of the brain is over-stimulated, as it would be by an increased amount of blood, its action would be increased. There are many things, going to show too that the circulation can be increased in certain portions of the brain and at the same time diminished in others. This is supposed to be effected through the the sympathetic nerves, sometimes called the vaso-motors. Any irritation of the sympathetics causes a contraction of the muscular coats of the arteries, or arterioles, which lessens their size, and it is quite easy to see that as this irritation is limited or extended to different parts of the sympathetics the blood supply of the different organs will be varied. There are many abnormal states of the brain that we are forced to account for upon these grounds, states whose symptoms are histeria, somnambulism, trance, etc. From the nature of the case we cannot demonstrate these things experimentally, as we can some others, for we cannot cut into the brain or in any way expose it to observation while these processes are going on; and if we irritate the vaso-motor nerves artificially we do not seem to have the means of limiting the range of irritation at will. But always, in hysteria, there is either hyperæsthesia with an increased, or anæsthesia with a diminished, flow of blood to other parts of the body; so that it would seem as if the relation was one of cause and effect. From analogy it is fair to argue then that the same condition obtains in the brain, and if we apply the same terms to the brain as to the nerves of feeling, we have hyperæsthesias of the special nerves, as sight, hearing, etc., going to the extent of halucinations, or anæsthesias going to the extent of temporary deafness, blindness, etc.

The phenomena of hypnotism, or mesmerism, as it is commonly called, from Mesmer, the man who first brought it into existence, are, in reality, the same as those seen in other mental states that come on naturally in certain persons. The apparent difference arises from the fact that mesmerism is, in general, artificially induced and the person mesmerized is supposed to be entirely under the will of the operator. This, however, is a misconception, for at most the operator simply puts the person in condition to mesmerize himself, and then he is at the mercy of whatever impressions make themselves most prominent. In the present state of our knowledge regarding the functions of different brain tracts it is exceedingly difficult to know how this can be done. From an analysis of hypnotic phenomena it would seem that in the main they consist of an abolition of will power, leaving the man to obey reflex impulse like a machine. A reflex impulse may be obeyed consciously or unconsciously. In any event it is simply the response that a nerve cell gives to a stimulus. If there is no consciousness present, we say we have no will. For in some way our philosophy has bound up our consciousness and will and responsibility in accordance with the dictates of theology and it is exceedingly difficult to unravel the knot. We may well ask if after all the will is not a higher kind of reflex responding to stimuli from brain cells that perform those processes which we call judgments. According to our present knowledge, the will is connected with a certain portion of the brain in the same way that speech is, and if this portion of the brain is destroyed, the will or at least the power of exercising it is destroyed. Diminish the blood supply in this particular portion of the brain until there is not sufficient to provoke its activity, and let the supply remain normal in the rest of the brain and you have one kind of automatism. The arrangement of blood vessels in the brain, is such however, that we cannot suppose this to be done without affecting other portions of it at the same time, and herein lies the difficulty of explaining some of the phenomena. We do not know what portions of the brain give rise to the phenomenon that we call consciousness. If pressure be made on almost any part of the anterior portions of the brain it produces unconsciousness, and when it is taken away conscious returnsness. That is all we know. A certain modification of consciousness takes place in the hypnotic state, and this may be due to a variation in the same blood supply that irrigates the tracts of brain habited by the will.

Now what is done in producing hypnotism?

1st. The attention is fixed upon some object that tires the eyes. This seems to be very necessary in subjects that have not already undergone the process. If the object is placed so that the axes of the eyes are somewhat inclined to each other a strain is brought upon the occular muscles which finally results in weariness. An unusual exertion in any part means an increased blood supply,·but if carried beyond a certain point, we lose, for a time, the power of exerting the organ. This happens with the eye. Gradually everything disappears except the article looked at; this loses its brightness; becomes black; the blood distribution is disturbed; the hypnosis commences, the pupil gradually expands.

Next, if it is mesmeric sleep that you want, approach the eyes suddenly with some object as if about to put them out and they will close. Tell the subject then that he cannot open them and he cannot. He has not will power enough to examine your assertion. He takes it for granted. There seems to be no inclination to test the veracity of any assertion and the man acts as if any impression made upon him were an actual fact. Among the phenomena developed in this state, there are many difficult to explain upon any hypothesis. Certain persons very ordinary in their natural condition become quite brilliant when hypnotized. Persons in a trance state have talked with an abnormal eloquence; others ignorant of music have suddenly developed a wonderful talent in this direction. A young Frenchman while mesmerized could solve difficult problems in mathematics and in his waking state knew very little of mathematics. Such things pass for inspiration. They certainly show a hyperæsthesia ot certain regions of cerebration. But how explain the sudden acquisition of something not before in consciousness? True enough mathematics is not a science in the sense that other sciences are. It is more a kind ot language, a knowledge of relations which seem to exist in the very nature of things and perhaps exists in us as well. Some persons seem to grasp it intuitively and in some very remarkable cases the power of calculation is joined to a mental weakness almost idiotic. By these persons problems appear to be solved by processes more direct than those found in mathematical treatises, as if a portion of the nerve paths used in calculation, a portion of the route traveled by the nerve power, had been cut off as useless. What the processes are by which these abnormal results are reached in hypnotic states, of course we do not know. We might suppose that the hyperæsthesia has aroused an ancestral memory, that it has caused the nerve force to traverse paths marked out by inheritance but not developed. So we might say in regard to music trance speaking, or any of the extraordinary powers which are so suddenly conferred. As far as I can discover these powers do not transcend what we might naturally expect from the person himself if he had undergone a process of training, and there are no extraordinary manifestations except in the line of a man's natural talents.

It is very difficult to estimate the size of the grain of truth in these manifestations. In many cases there is a tendency to deceive and in the spectators a tendency to exaggerate. But if we look upon education as it is, simply as an unfolding, a co-ordinating of the powers that are in a man already and not as a pouring in of new material, it may be more readily explained how new co-ordinations can be suddenly brought about. If anything had been accomplished by hypnotism which was before unattainable to the race, if some class of problems could be solved which had so far baffled the powers of the best of us, we might then be obliged to look outside for an explanation.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The thirty-fourth session of the association assembled under favorable auspices in the classical city of Ann Arbor, Michigan, on August 26th, 1885. Ann Arbor has an air of culture and refinement, and its selection by the standing committee as a place of meeting, proved to be wise, and most satisfactory to all who attended.

The white walls of the University, the great pillars of the porch, together with the stately avenues of trees on the college campus, seemed to bid us welcome, and to impress the senses with the approach of a feast ot intellect and a contest of thought. And the good people of Ann Arbor gave us receptions and entertainments worthy the fair fame of their beautiful city.

The address of the retiring President J. P. Lesley exhibited the results of mature thought, and was listened to with marked attention by an appreciative audience. From a multitude of good things we quote: "The age of romance in science is part of the forgotten past. The New World has grown grey-haired in fifty years, intolerant of the irresponsibility, the sportiveness, the poetry, the music, the superstitions, the affections of its youth; dealing only in hard facts, and in their causes and consequences; weighing and measuring all things; collating, comparing, and classifying; insisting upon investigation at all points; formulating rigid laws; scoffing at the unseen and unknowable; and transmitting the fear of God and the hope of heaven into a zeal for the exact determination of the units of force, and a confident expectation that railroads will soon traverse all the unoccupied regions of the earth, and malleable steel replace wood in the mechanic arts."

But Prof. Lesley originated an expression which will become classical—"dead-work." He said: "To describe dead-work is to narrate all those portions of our work which consume the most time, give the most trouble, require the greatest patience and endurance, and seem to produce the most insignificant results. It comprises the collection, collation, comparison and adjustment, the elimination, correction and re-selection, the calculation and representation—in a word, the first, second and third handling of our data in any branch of human learning—wholly perfunctory, preparatory, and mechanical, wholly tentative, experimental, and defensive,—without which it is dangerous to proceed a single stage into reasoning on the unknown, and futile to imagine that we can advance in science ourselves, or assist in its advancement in the world."

Section A was favored with a profound mathematical paper on "The effect upon the earth's velocity produced by small bodies passing near it," by Prof. H. A. Newton, president of the Association. This problem is one of great difficulty, and requires the highest mathematical skill in its solution. But it was solved completely. The master mind penetrated all hidden labyrinths in computation, and satisfied the most formidable equations. Prof. Newton demonstrated these theorems in gravitational astronomy:

"A. If a cylindrical stream of small bodies evenly distributed and all moving in the same direction with common velocity shall move past the earth, supposed to be in the axis of the cylinder, the small bodies by the law of universal gravitation shall communicate to the earth a velocity along the axis in each unit of time:

(1) That shall be proportional to the density of the group:

(2) That shall decrease as the velocity increases, varying very nearly inversely as the square of the velocity:

(3) That shall increase with the radius of the cylinder, and be proportional to the logarithm of that radius, measured by a unit that differs from the earth's radius by a small quantity which is a function of the velocity."—*Newton's Abstract.*

The professor then proved that if this cylindric meteoric stream had an infinite radius, the velocity imparted to the earth by its passage would be infinite; but if its radius be comparable with ordinary stellar distances then motion so communicated to the earth would not be large. It was then shown that the cylinder of meteors even if of infinite diameter, and moving with a velocity *greater* than that of the earth, there would result an exceedingly minute acceleration of the earth's motion! If, however, the velocity of the meteors was *less* than that of the earth, the effect on the motion of the earth, would depend on the absolute velocity of the bodies, an assumed extent of the stream, both producing a minute retardation, yet the "effect is much too small to be detected by observation."

It was likewise proven that impact of meteoroids on the Moon can only increase its motion by "an exceedingly minute fraction of the Moon's observed acceleration." The chief result of the investigation is that the siderial year will not be lengthened or shortened by impact or flight of small cosmical masses.

Prof. Wm. Harkness, U. S. N., then presented a technical paper on the "Flexure of transit instruments," and showed how difficult it is to eliminate errors, since solid metal instruments are elastic enough to affect the line of collimation.

Prof. G. W. Hough, Dearborn Observatory, Chicago, then described his new printing chronography, which prints minutes, seconds and hundredths of a second on paper scrolls, which next morning can be read off directly. The mechanism is driven by a storage battery of the Professor's own construction, having an electro-motive energy of six volts, and the whole thing was termed a "luxury" by the astronomer.

Prof. J. B. Webb next described a method he uses in transformation of polar co-ordinates.

And then came Prof. C. H. Rockwell, of Caroline Island eclipse fame, who gave us an elaborate explanation of the new astronomical instrument—the Almucantar. He placed on the black-board a series of observations on fundamental stars for latitude. These observations were of surprising accuracy considering the simplicity of the instrument which consists of a telescope furnished with circles, verniers and micrometer, all resting on a heavy base which floats in mercury. We scarcely know what Rockwell will do next; he is liable at any time to start on an expedition to the end of the world and even now is in the process of making up his mind to go to the Congo country to witness the total solar eclipse of August 28-9th, 1886.

A pleasing change was made at Ann Arbor, in that Sections A and B held alternate sessions, allowing the privilege of hearing discussions in both. In Section B, the proceedings were of great interest.

Prof. S. P. Langley during the last two years has made refined research with the bolometer on the infra-red portion of the spectrum of the sun. This close student peers into the innermost recesses of Nature and seeks the wave-lengths of that heat radiation sustaining life on the globe.

A drawing revealing immense extension to the sun's spectrum was shown, wherein the visible portion was represented by a band of colors two or three inches in length, while the invisible—as detected by the bolometer—extended seven or eight feet beyond; the Professor stating that if the light spectrum be drawn to any ordinary scale, then the heat spectrum would not fall within the room. Great questions are involved since the energy in the infra-red spectrum sustains life on the earth: and the inquiry was raised, are the wave-lengths of energy radiated from the earth the same as the wave-lengths received from the sun? Varied experiments were made at Alleghany Observatory, to answer the question, with the result that the wave-lengths of energy receding from the earth are twenty times longer than those received. It seems reasonable that in the near future physicists will find the reason why the temperature of the earth and its atmosphere is so much higher than that of outside space.

But, this addition to the hitherto known spectrum was only made possible by *perfect* rock salt prisms manufactured by Mr. J. A. Brashear, Pittsburg, Pa. The processes of their manufacture were explained by Mr. Brashear, who displayed elegant specimens, while recounting the troubles met with in preparing absolutely plain surfaces. And it is with these prisms of salt that Prof. Langley makes unheard of discoveries in the infra-red. We quote Mr. Brashear's exact language: "The work Prof. Langley has done with the bolometer and rock-salt prisms on the spectra of some sources of invisible radiation, and in the recognition of hitherto unmeasured wave-lengths is most important. Suffice to say that if we place the value of the now known spectrum equal to one, his researches have revealed three-fifths of it."

We were impressed with the beauty of Prof. Rouland's diffraction gratings now made only by Mr. Brashear, who had a number on exhibition. And since spectroscopy is of such value in modern physics, we, at the risk of taking too much time, desire to note in detail these triumphs of genius and skill. We insert Mr. Bashear's own language as follows:

"The smallest grating—one inch—contains about fifteen thousand lines, and is estimated to be as powerful as a battery of twelve prisms. We have seen fourteen lines between the two D lines, and both the D lines double. This, of course, is out of all comparison with any prism spectroscope. The gratings are tested with a viewing telescope and collimator of six and three fourths inches aperture and seven feet focal length, probably the most powerful spectroscope in the world. And all gratings must stand this test before they are passed. The screw of the ruling engine is perhaps the most perfect mechanism ever made as the error of the length is less than half a mean wave-length of light. Though one of the most prominent European theoretical opticians declared it to be impossible to make a concave grating to give a perfect spectrum, Prof. Rowland demonstrated that it could be done. And now the work of these concave gratings is known all over the scientific world, especially in spectrum photography. When Thollon and Augstrom show seven or eight lines between the H lines in their standard maps, photographs taken by the aid of the large concave gratings show a hundred or more. And where the maps show no lines beyond the H group, one thousand are shown in the photographs up to wave-length thirty-seven, and hundreds may be counted beyond."

Surely the sun is surrounded by an absorptive atmosphere, which bids fair to be proven to be made up of all elements in a gaseous form, and if Newton's spirit can behold the actions of man on the earth, his soul must be filled with admiration at the advance of studies in the spectrum; while Fraunhoffer would be filled with amazement when viewing the multitude of lines rendered visible in the diffraction spectra of suns and nebulæ, telegraphic signals from the solitudes of space spelling out the names of the constituent materials of the most distant incandescent bodies.

Mr. Brashear then made a magnificent spectrum on the ceiling of the University by simply holding a grating in the sunlight shining through a window.

Prof. E. L. Nichols.—University of Kansas,—then presented a paper describing an elaborate series of experiments made with a spectro-photometer. He projected a spectrum of the sky, and composed it with spectra derived from light reflected from substances supposed to be white, such as magnesium carbonate, calcium sulphate, etc. Curves of results were shown and the data appeared to teach that the spectrum of a clear blue sky differs but little from spectra of white light or rather of light reflected from white bodies. It seemed impossible to escape the conclusion that the blue color of the sky is not really due to an excess of blue rays, but to a tendency of the retina to sensitiveness to blue or violet light. An apparent discrepancy in results of spectroscopic study seems to have arisen between Professors Langley and Nichols, which must be explained by further investigation. The scientific world knows that Langley went above nearly half the mass of the air on Mt. Whitney, armed with the spectroscope. From his report as delivered to the Royal Institution,—Science vol. V. No. 121, page 442, we quote: "I think we already begin to see that it is, at any rate conceivable that we *may* have been hitherto under a delusion about the true color of the sun, though of course this is not proving that we have been so. And it will at any rate, I hope, be evident that here is a question raised which ought to be settled: for the blueness of the sun if proven, evidently effects our present knowledge in many ways, and will modify our present views in optics, in meteorology, and in numerous other things;—in optics, because we should find that white light is *not* the sum of the sun's radiations, but only by those dregs of them which have filtered down to us." And on page 449, in speaking of his experiments on Mt. Whitney in building up curves representing solar energy, Langley says: "These have grown out of all proportion at the blue end, as you see by the outer dotted curve, and now we have attained by actual measurement that evidence which we sought, and by thus reproducing the spectrum outside the atmosphere, and then recombining the colors of like methods to those you have seen on the screen, we finally get the true color of the sun, which tends, broadly speaking, to blue."

It will be interesting to learn what decision of the questions here raised will eventually be made. Valuable papers were also presented in Section B, by Professors Carhart, Mendenhall ond Dolbear on subjects pertaining to electricity, while Mr. Clayton thought he had detected a law of change in barometric pressure and temperature.

Of the great number of papers read

in Section C, we mention one, that of E. H. and A. H. Cowles and C. F. Mabrey on an electric furnace for reducing ores of Aluminium. Very likely this furnace will revolutionize metallurgy, and mankind will derive much benefit if this metal Aluminium can be cheapened in price by electrical reduction. The ore is placed in the furnace between the electrodes of a dynamo, and is melted by the intense heat of the broken current.

This Aluminium question opens up several important possibilities, and the imagination readily conceives of an Aluminium steamer skimming across the Atlantic with increased velocity rendered attainable by the greatly reduced weight. And by another flight, we can imagine an airship of this light metal, hurrying to Europe, above the clouds, completely ignoring the ocean wave.

The Section of Geology was replete with contributions to our knowledge of the earth, notably by Professors Alexander Winchell, Orton, Williams, Claypole, Worthen and N. H. Winchell.

The Association was well entertained in the evening by an illustrated lecture on the proposed Tehuantepec ship railroad. The gigantic undertaking was fully explained by projection of lantern slides, and the details made clear. An immense car truck is to be rolled out upon a pontoon. Water is admitted and the whole sinks to the bottom. The ship is then brought directly over the car, when pumps exhaust the pontoon allowing air to enter and raise the whole mechanism, car, ship and all. The trucks and its mighty load is then hauled upon the railroad, which consists of six rails, making a road bed nearly forty feet wide. A steamship can be taken out of the ocean and placed on the track in thirty minutes; three sixty-five ton locomotives are able to haul the car and ship, the whole length of the railroad 134 miles, with a velocity of fifteen miles per hour. Really we are living in eventful times,—Langley is telling us all about the sun, the Cowles are solving the problem of wresting Aluminium from its refractory compounds, while the commercial unrest of man is about to break the isthmian barrier that has so long retarded that auspicious day—which is surely coming—when the nations of the earth will be as one.

Prof. E. S. Morse is President-elect, and Buffalo, N. Y. the place of next meeting.

"THE CRADLE OF THE HUMAN RACE AT THE NORTH POLE."

In the REVIEW for August is an article copied from *The Dial* headed "The Quest for the Primeval Eden," intended as a criticism on Dr. Wm. F. Warren's new book entitled "Paradise Found—The Cradle of the Human Race at the North Pole." Its writer does so little justice to the work he undertakes to criticise that I may be pardoned for offering some observations of my own upon the subject.

It is quite inevitable that, according to scholarship, one person should see many important things in a learned and thoughtful treatise like Dr. Warren's which another does not. There has been a vast amount of learned ignorance shelved away in our libraries upon the subject of paleontology and kindred sciences which is absolutely detrimental to the advancement of true scholarship. Teachers of the ancient classics are too generally so muddled by the evil genius of misinterpretation that misunderstanding has become chronic with almost the whole tribe. Having been nourished in a barrel, their vision is bounded by what they are able to see through the bung-hole.

Dr. Warren's book will mean to the reader so much and no more than his familiarity with the general facts and truths of paleontology and its kindred sciences have prepared him to understand. Yet it may be an authentic voice upon the subject of which it treats. To be able to pass intelligent judgment upon it, one must be already well furnished with a broad and varied knowledge of the religious ideas of all the great nations of ancient and modern times—their myths, traditions, and folk-lore—so that he may be competent to compare and relate together the thousand facts bearing upon the solution of the question whether there was for the human race one primitive centre of distribution, and if so, where it was located.

Dr. Warren sets out with the now almost universally accepted doctrine "that the earth is a slowly cooling body." He says: "All authorities in this field hold and teach that the time was when the slowly solidifying planet was too hot to support any form of life; and that only at some particular time in the cooling process was there a temperature reached which was adapted to the necessities of living beings. On what portion or the earth's surface, now," he asks, "would this temperature be first reached?" The answer is at once obvious—at the poles. "We asked the geologist this question," says the Doctor: "is the hypothesis of a primeval polar Eden admissible?" Looking at the slowly cooling earth he replies; 'Eden conditions have probably, at one time or another, been found everywhere upon the surface of the earth. Paradise may have been anywhere.' Looking at the cosmic environment, however, he adds,—'but while Paradise may have been anywhere, the *first* portions of the earth's surface sufficiently cool to present the conditions of Eden life were assuredly at the poles.'" Science, then, concedes so much in favor of our author's conclusion that the cradle of the human race was at the North Pole." Why at the North Pole rather than the South, he settles upon another class of facts which are of a more affirmative character.

In Part III. the author gives the testimony of prehistoric climatology, and of paleontological botany, zoology, anthropology, and ethnology, as declared by all the wonderful discoveries in these several departments of investigation, going to show, as affirmed over and over again, on the highest scientific authority, that "till a very recent period, geologically speaking, our earth enjoyed a warm and genial climate up to the very poles themselves; and that all its vegetation was everywhere evergreen, of much the same type as that which now prevails in the modern tropics." Moreover, the best authorities in the science of paleontological botany in Europe and America "have lately reached the conclusion that all the floral types and forms revealed in the oldest fossils of the earth originated in the region of the North Pole, and then spread first over the Northern, and then over the Southern Hemisphere, *proceeding from North to South*." Just as conclusive is the testimony that animal life has followed the law. To use Dr. Warren's own words: "From all the facts but one conclusion is possible; and that is that like as the Arctic Pole is the mother-region of all plants, so it is the mother-region of all animals,—the region where, in the beginning, God created every beast of the earth after his kind, and cattle after their kind; and this is the conclusion now reached and announced by all comparative zoologists who busy themselves with the problem of the origin and prehistoric distribution of the animal world. But to believe that Prof. Herr's *Miocene Arctic Continent* was the cradle of all faunal forms, and yet deny that it was also the cradle of the human race, is what few philosophical minds are likely long to do."

Dr. Warren's chapters on Ancient Cosmology and Mythical Geography are perhaps the most interesting and remarkable collection of testimonies in favor of his hypothesis of any in his book. He shows that according to the traditions of all the old nations of the world, Japanese, Chinese, East Aryans or Hindus, Iranians or Old Persians. Akkadians (including Assyrians and Babylonians), ancient Egyptians and ancient Greeks—the cradle of the human race, the Eden of mankind, was in the centre of the earth, and that in nearly every ancient literature we encounter the strange expression, "the Navel of the Earth," coupled with the primeval birth-place of man. This centre of outgoing life has also in all the cosmogonies its Atlas's Pillar, or axis of the world. "It is the the umbrella-staff of Burmese cosmology, the churning-stick of India's gods and demons. It is the Trunk of every cosmical Tree. It is the shadowless lance of Alexander; the Tortoise-piercing (earth-piercing) Arrow of the Mongolian Heaven-god; the Spear of Izanagi; the Hacha de Cobra on which the Heavens of the

Miztecs rested. It is the Cord which the ancient Vedic-bard saw stretched from one side of the universe to the other. Is it not the Psalmist's 'Line' of the Heavens which is 'gone out through' the very 'earth,' and on 'to the end of the world?' It is the Irminsul of the Germans, as expressly recognized by Grimm. It is the Tower of Kronos; it is Plato's Spindle of Necessity; it is the Azacol of the North African Sunis; it is the Ladder with the Seven Lamps in the rites of Mithra; it is the Talmudic Pillar which connects the Paradise Celestial and the Paradise Terrestrial."

This Eden of the race had also in all the cosmologies its Mount of the Gods, Mount Atlas, Olympus, Meru, Tien-Chan, Ila, Sineru, Asgard, and the Aztec Culhuacan, all tell the same story; and all refer themselves by their traditions and religious observances, variously expressed, to a "happy and prosperous place," not in their own midst, but in a far-off land of sacred associations, where the "holy house of the gods" is situated,—a land "into the heart whereof man hath not penetrated;" a place underneath the "overshadowing world-tree," and beside the "full waters." "No description," says Dr. Warren, "could more perfectly identify the spot with the Artic Pole of ancient Asiatic mythology. Yet this testimony stands not alone; for in the fragment of another text we are told of a 'dwelling' which 'the gods created for' the first human beings—a dwelling in which they 'became great' and 'increased in numbers,' and the location of which is described in words exactly corresponding to those of Iranian, Indian, Chinese, Eddaic, and Aztec literature; namely, *in the centre of the earth.*"

When, with all these antecedent probabilities before us favoring the Northern origin of nations, we take into account the myths, traditions, and intimations of ancient history which with greater or less distinctness relate all the races of men to a Northern home, far back in the twilight of antiquity, there would seem to to be no escape from the conclusion of our author that the North Polar regions of the earth were the original abode of the ancestors of the human race.

It would be impossible in this monograph to give more than a mere hint—a simple touch or two—bearing upon the importance of Dr. Warren's book to the really earnest and truth seeking student of Ethnology. To understand its true value he must read it himself. It will prove to him a most invaluable key by means of which many mysteries may be unlocked, and the cobwebs of many vague and misleading interpretations of the ancient classics swept away.

THE SONG-NOTES OF THE PERIODICAL CICADA.

There are few more interesting subjects of study than the notes of insects and the different mechanisms by which they are produced. From the day when Aristotle discoursed upon them they have interested every observant entomologist. It is difficult to record them in musical symbols that can be reproduced on musical instruments, some of the more successful and interesting attempts in this direction having been made by Mr. S. H. Scudder. I have studied closely the notes of a number of species and have published some of the observations.[*]

In the notes of the true stridulators, more particularly, as to the common Tree Cricket and Katydids, I have been impressed with the variation both in the pitch and in the character of the note, dependent on the age of the specimen and the condition of the atmosphere whether as to moisture, density or temperature. Yet with similarity in these conditions the note of the same species will be constant and easily recognizable.

A few remarks upon *Cicada septendecim* will doubtless prove of interest since the species has this year occupied so much attention. I do not find that the notes have been anywhere very carefully described in detail; nor would I pretend to put them to musical scale. Writing seventeen years ago I described the notes in a general way as follows: "The general noise on approaching the infested woods, is a compromise between that of a distant threshing machine and a distant frog pond. That which they make when disturbed mimics a nest of young snakes or young birds under similar circumstances—a sort of scream. They can also produce a chirp somewhat like that of a cricket, and a very loud shrill screech, prolonged for fifteen or twenty seconds, and gradually increasing in force and then decreasing."[†]

There are three prevalent noises which, in their blending, go to make the general noise as described above. These are,—

First: That ordinarily known as a *Phar-r-r-r-aoh* note. This is the note most often heard during the early maturity of the males and especially from isolated males or from limited numbers. It is variable in pitch and volume according to the condition just mentioned as generally affecting insect melodists. Its duration averages from two to three seconds; and the *aoh* termination is a rather mournful lowering of the general pitch and is also somewhat variable in pitch, distinctness and duration. In a very clear atmosphere and at certain distances an individual note has often recalled that made at a distance by the whistling of a rapid train passing under a short tunnel. But when heard in sufficient proximity, the rolling nature of the note will undoubtedly remind most persons more of the croaking of certain frogs than of anything else. I have heard it so soft and low and so void of the *ooh* termination that it was the counterpart of that made by *Oecanthus Latipennis* Riley, late in Autumn and when shortened from age and debility of the stridulator.

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[*] 3rd Rep. Ins. Mo. pps. 14, 153, 154: 4th do. p. 139; 6th do. pps. 150—169.

[†] 1st Rep. Ins. Mo. 1868, p. 24.

Second: The loudest note and the one which is undoubtedly most identified with the species in the popular mind, is what may be called the "screech." This is the note described by Fitch as "represented by the letters *tsh-e-e-E-E-E-E-E-e-ou*, uttered continuously, and prolonged to a quarter or half a minute in length, loud and piercing in the ear, and its termination gradually lowered till the sound expires." Dr. Fitch errs as to the length of its duration, and I have also erred in the same direction unless indeed there is a still greater range than my subsequent observations would indicate.

Since this was written I have heard on two occasions this note prolonged to twenty seconds, but this is very abnormal, and I have no other evidence than the season (June 20) that it belonged to *C. septendecim.*

It is more probable, however, that our memories were at fault, for, as I have verified this year, this *shrill* ordinarily lasts from two to three seconds—though occasionally longer—and is repeated at intervals of every five seconds. This note is rarely made by solitary males or when but few are gathered together, but it is the prevailing note in the height of the season, and is made in unison, *i. e.*, the assembled males on a given tree, or within a given grove, are prompted to it simultaneously, so that its intensity becomes almost deafening at times. It is of the same nature as that made by the Dog day Cicada (*Cicada pruniosa* Say) and in its higher and louder soundings is not unlike the commoner shrill of that species, though by no means so continuous. It is what in the distance gives the threshing-machine sound; and it has often recalled that which I have heard in a saw-mill when a log is being cut cross-wise by a circular saw.

Third: There is what may be called the intermittent, chirping sound, which consists of a series of fifteen to thirty, but usually about twenty-two sharp notes sometimes double, lasting in the aggregate about five seconds. This sound is so much like that produced by the Barn or Chimney swallow (*Hirrundo erythrogastra*) that a description of one would answer fairly well for both. It resembles also, though clearer and of higher pitch, the note of *Microcentrus retinervis* (Burm) which I have likened to the slow turning of a child's wooden rattle, highly pitched.

The above notes are, so far as I have observed, of higher pitch though of less volume in the smaller *cassinii* form.

The other notes viz., that made when the insect is disturbed, and a not infrequent short cry that may be likened to that of a chick, are comparatively unimportant; but no one could do justice to the notes of this insect without describing the three peculiar sounds which I have attempted to describe above, and which are commingled in the woods where the species is at all common, though the undulatory screech is by far the most intense and most likely to be remembered.

[The paper concluded with a description of the mechanism by which these various notes are produced, and after referring to the elaborate works on this mechanism, of Reaumur, Rosel, Solier, Landois and others, agrees with the earlier authors in considering the notes stridulatory rather than vocal. Riley finds that Landois, one of the last writers, who reversed the previous conclusions and asserted the notes to be vocal and due to the metathoracic spiracles, was essentially wrong. The noise produced is not made as in the buzzing Diptera as Landois concluded, for, while the air passages act their part in modulating the vibrations, the source of the noise is found to be in the parchment-like and ribbed drums, a portion of which is made to vibrate with great rapidity by the strong V-shaped muscles located in the abdomen, and which have great muscular power so that, even after separation from the insect, when pressed with a point held in the hand, they produce such intense vibration that it may be likened to a galvanic shock.]

A FIRST-PRIZE ESSAY ON DISINFECTANTS.

So common has it become for inferior work to gain prizes that the best talent rarely now competes. Ignorant or dishonest judgment discourages all such laudable efforts. A case in point constitutes the subject of this article. But for the fact that this one is likely to do much harm to the general public, the best course to pursue toward it is silence. Unfortunately, the subject is a serious one, and becomes doubly serious when the facts all appear. The competing essays have been bound in book form, and the volume is being extensively advertised among the Druggists of the United States. A leading light in the Pharmaceutical world was one of the awarding judges. His high position is sufficient endorsement among the men for whom it is intended. The general public rely upon druggists for information upon this subject. They must prepare all disinfectants used throughout the country unless proprietary. If they imbibe false information, the whole nation must suffer. The splendid work of the committee on disinfectants of the National Board of Health will be almost nullified by this one volume, unless some warning voice is raised by the friends of sanitary science. Facts necessary to a clear appreciation of the subject are conspicuous by their absence from the article. In no place does the author make clear to his readers what disinfectants really are, how they are tested as to value, nor their relative powers. He makes no distinction between deodorizers and disinfectants, nor does he even hint at the all important distinction between spore-destroying and non-spore-destroying agents. He markedly contradicts himself a number of times; not alone because he fails to distinguish between the guesses of twenty years ago and the knowledge of to-day, but because he fails to see what his own words mean. Instead of attacking, he upholds the most vulgar superstitions. All disinfectants have some defects we must know in order to handle them understandingly. He nowhere shows the defects of the agents he recommends. The price of a disinfectant, while of little interest to the few rich, is the first consideration with the many poor. The author does not deign to give any light upon the question. The two essays given subordinate positions possessed the merit of accuracy. This is much more than can be said of his. Very much of value which he neglects, they present, and nothing of the least utility in his, but can be found in far better shape in each of them. The first condition of the award was to be scientific accuracy. In the public announcement of the decision this condition is unblushingly declared excluded. By what right or authority did they do this? If the judges were not scientific experts upon the subject they should have given place to men who were. We have definite knowledge in this branch of Sanitary Science and competent men substantially agree as to what is true and false, established and questionable. The second condition forbade unnecessary technical terms. The first prize essay is the only one using chemical names where there are distinct common ones, and it even introduces such medical terms as "zymotic." The second condition was as much disregarded as the first. On what grounds then were the prizes awarded? The third and last condition was that there should be "clear directions for the preparation and use of the disinfectant recommended." The committee evidently took this to mean that shot-gun formulae, such as belong to the barbarous stage of Sanitary Science was intended. Good disinfectants are few and simple. Their names and exact relative values with many others of their class were given in the papers already mentioned. In describing their properties, full and complete directions were made clear. The first prize paper was filled up with obsolete receipts and ancient notions of a bygone age. Had the prizes been offered for an essay on Chemistry, and the highest given to a man who ransacked the literature of alchemy for his matter, the blunder would have been precisely the same in kind. Every stipulated condition of the contest has been wofully violated. The following analysis of the leading features of the paper show its utter lack of value as a contribution to the literature of disinfectants.

"Disinfection is defined to be the destruction of the *poisons* of infectious and contagious diseases." (p. 37.) The poisons of such diseases are the ptomaines. Disinfection has nothing to do with these. It aims at destroying the *cause* of such diseases. He begins with a false definition.

"Fire, certain forms of combustion, or oxidation *alone* are capable of completely disinfecting a locality." (p. 37.) All organic solvents, superheated steam and albumen coagulators he has either forgotten or never knew.

"Disinfectants are of two kinds; natural and artificial." (p. 37.) His classification, like his definition is a blunder. All are natural and all artificial as we view them. A true dual classification would be into physical and chemical. Dry and moist heat find no place in his classification.

"By its (ozone's) formation and destruction a vast amount of *materies morbi* may be destroyed." (p. 38.) The destruction of putrescent matter by ozone or anything else deodorizes but does not necessarily disinfect.

"Pure air must be accepted as the most important disinfectant and preventative measure that we have." (p. 38.) Disease germs can be preserved for long periods of time in pure air retaining their virulence. Sufficient dilution renders them obnoxious. Ventilation is better than disinfection on this account. Pure air, as such, is not known to possess any disinfecting power.

"Second only to pure air is pure water." (p. 38.) Bacteria often make their home in pure water. How then can it be called a disinfectant? Otherwise pure water has been known to contain germs enough to cause an epidemic. Its currents can dilute them. The water cannot harm them. As a cleansing agent to wash them away it is invaluable. As a disinfectant to destroy them it is useless.

"I maintain that pure air and pure water are the most important disinfectants." (p. 39.) Competent judges will maintain that he does not know what a disinfectant is.

"The artificial or chemical disinfectants constitute an important division." (p. 39.) Are air, water and ozone not chemical? It would seem not, as he excludes them from this class.

"Bromine and iodine can be employed directly in the sick room. They are exposed in an open vessel at a slightly elevated temperature." (p. 40.) Who ever tries this trick can be employed directly in getting the undertaker to measure the patient for a coffin; for it will surely be needed if even half enough is volatilized to kill a vigorous germ. No volatile disinfectant is of any value unless used strong enough to destroy all life, and must be used in a moist atmosphere. The author by failing to qualify the truths he has stated of such agents, by these necessary facts renders his whole remarks thereon worthless. No one can employ them as he directs, and gain any good results.

"Heat and steam may be considered as a subdivision of their own among the volatile disinfectants." (p. 41.) It is certainly news to the world that heat is material and can be volatilized.

"The volatile oils. These are feeble disinfectants." (p. 42.) Many volatile oils, such as turpentine, occupy a far higher place as disinfectants than nine tenths of the articles he lauds. As aerial disinfectants they are valueless. As deodorants they are pretty good.

"It (mercuric chloride) is almost exclusively used by physicians and surgeons for cleaning their instruments." (p. 42.) In the most serious cases they are willing to destroy their instruments by this treatment. To say that it is almost exclusively used is to state what is not true. Corrosive sublimate destroys every instrument it touches unless speedily and thoroughly cleaned therefrom afterwards.

"It should be used in the proportion of one to one thousand." (p. 42.) It is just as efficient of one tenth this strength, and far less dangerous. Where no farther dilution is needed one in one hundred thousand has been found plenty where rapid destruction is not so important as thorough work.

"A solution of twice as strong as the foregoing can be used for the disinfection of the sputa and other discharges of cholera patients." (p. 42.) The greater the strength the quicker will it coagulate the albumen around nests of germs and thus act as a preserver instead of destroyer. Here again the author's ignorance appears. He did not know that his advice required supplementing to save it from doing positive harm. Such solutions for such purposes must contain, beside the mercuric chloride, some powerful oxidizer like permanganate of potash to eat away the albumen and let it attack the germs. He did not even seem to know that his aquaeous solutions of this salt of mercury would change to calomel unless protected by some other chloride. As his lack of knowledge rendered his advice dangerous and worthless when treating of volatile agents so we discover it has a similar effect in dealing with solid ones. All things considered corrosive sublimate, properly handled, is our most efficient disinfectant. In spite of this fact the author gives it no marked prominence over common salt, quicklime and charcoal, articles perfectly valueless for this purpose. Biniodide of mercury, the most powferful disinfectant known, iodide of silver, nitrate of silver and osmic acid—all potent germ destroyers—he has not so much as mentioned. The sulphate and acetate of iron, quicklime, gypsum and charcoal, articles possessing not one particle of disinfecting power, he commends in their stead.

"Twenty-four ounces (of table salt) to a gallon of water, or a handful or so to a pail of water, are the best proportions for ordinary use." (p. 43.) And this from a man who insists upon putting two drachms of Mercuric chloride into a gallon of water for excretions and sputa. One grain has more germ destroying virtue than ten times this amount of salt. Yet he insists upon one hundred and twenty grains.

"As to whether this class (Carbolic Acid) deserves our attention at all is a question difficult for decision." (p. 45.) Copperas and table salt receive a paragraph apiece to laud their virtues as disinfectants while the whole phenol group must be extinguished with a doubt. Could anything be more refreshingly verdant? Carbolic acid is bad enough surely. Superstition has caused it to be overestimated. We now know its exact power. It stands far ahead of his whole list if we exclude Mercuric Chloride and the hypochlorites. It is perfectly worthless as an aerial disinfectant. He evidently knows nothing of its place as a disinfectant.

"This group includes the antiseptics, alcohol, etc. Among the prominent antiseptics are benzoic acid and benzoates, borates, as aluminium borate, etc., borax, boro-glycerides, formic acid, picric acid, pyrogallic acid, resorcin, salicylic acid, etc." (p. 45.) What does he mean by "antiseptics, alcohol, etc.?" He seems to think that alcohol is not an antiseptic. Did he fail to put these agents in the order of their power because he did not know enough? It looks like it. As with these, so with all others? their arrangement is a perfect chaos. Why class them as antiseptics and give far less efficient agents the dignified title of disinfectants The fact is, the man was utterly at sea without compass or rudder. He does not appear to know that antiseptics are disinfectants if strong enough to be used to disinfect or destroy infection and disinfectants are antiseptics if used to keep down sepsis.

"It is impossible to undertake to discuss their (benzoic acid, salicylic acid, etc.) relative value here." (p. 45.) Why not? Many of them are far more important than the majority of substances he has discussed. In fact, this is a common failing of his whole paper. It gives undue prominence to substances of the most trashy character passing with contemptuous neglect the very sheet-anchors of all true sanitarians. Chloride of lime, the queen of disinfectants, he passes by with six lines. Copperas receives a paragraph to itself. The last is no better than a magic sign.

"All that is required to *immediately* purify and sweeten a contaminated air supply, *however originated*, is to dip a cloth in the liquid (an aqueous solution of chloride of lead and salt) and hang it up in an apartment." (p. 43.) Is the man so ignorant that he for a moment can entertain such a belief? Better things would be expected from a boy of eight or any intelligent but illiterate domestic. Readers of this review may doubt the correctness of the quotation, but I assure them it is a verbatim transcription, unmodified by any context. That such arrant superstition should appear in any scientific paper, would be incredible, if our senses did not confirm it. That the paper containing it should be offered in competition for a prize is almost beyond credulity. That that paper should, in the nineteenth century, win a prize is marvelous! That honest, intelligent men could award it the first prize is, to say the least, miraculous! Can it be possible that the judges ever read the essay in the most cursory manner? Do they know that their decision will make them occupy a position the reverse of enviable, when an intelligent public puts its stamp upon their work? The notes of the paper occupy very nearly the same space as the article itself. They are thrown in without regard to value. Sixteen receipts are given, every one of which is of most questionable worth. Not one of them contains a reliable sporicide. To do the work of five cents' worth of chloride of lime, or a fraction of a cents' worth of corrosive sublimate, would take many dollars' worth of the best he has given.

EDITORIAL.

VIVISECTION.

It is a very amusing task to study the idiosyncracies of human nature as exhibited in communications to periodicals and newspapers. But the most astounding expressions of "crank" theories and views appear in the occasional pamphlet and the ubiquitous tract. One of the latter is thus noticed in *The Medical Press and Circular:*

> A lady who evidently feels very strongly on the subject of vivisection has recently gone to the expense and trouble of sending from abroad a circular addressed to "her" colleagues and fellow workers "for the benefit of the human race and animal emancipation." She did not confine her kind attention, however, to those, and those alone, or else she has been gravely misinformed as to our sentiments, and it may be to this we are indebted for our copy. This lady makes a startling though possibly not a novel proposition; she proposes the total abolition of vivisection on animals, and would substitute condemned criminals, whom she would solicit as free agents to offer their degraded bodies while still living for the advancement of science as some slight compensation to society for the wrong they have done her. Should they survive the experiments (a point the lady evidently entertains some very serious doubts upon) a free pardon would be their reward.
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> Anæsthetics would be allowed, but not encouraged. The author of the circular touches upon a vexed question when she advances that animals are at least as worthy of protection as men, because having no souls, their lives are doubly precious to them. This is more novel than her first suggestion, and takes some answering—we will not attempt it here. She harrows unnecessarily the feelings of the scientific students by depicting in glowing colours the disgust that would be felt and shown by the "fair pure girl," to whose hand he has dared to aspire, if only his revolting practices were brought to light. This is her argumentum ad hominem, and is calculated to act seriously as a deterrent to all but determined bachelors.
>
> She holds up to merited opprobrium those operators whose names are published in the "book of infamy," which would seem to be a directory containing their names and addresses, and is anxious under the lex talionis to provide for their future unhappiness. The author, in her anxiety to wipe out what she characterizes as a "hideous blot" on our fair humanity, occasionally oversteps, like many of her fellows in England, the limits of both courtesy and justice. Looking upon suffering as a means of regeneration, she anathematizes those whose profession and pride it is to alleviate it and condemns its professors to unhappiness in this world and acute suffering in the next.

What a picture, this, of the average woman with a mission! It must not be supposed that the crude and ignorant suggestions, the silly vaporings, the comical gravity, of such female Knights of La Mancha, find no Sancho Panzas as listeners. No doubt a cause which appeals so strongly to the lap-dog interest is as well started into a career of glory and success as the famous colony of Borrioboolagha.

Seriously the lady in question is quite as sensible as the great body of anti-vivisectionists who rant and rave over the corpses of dogs and monkeys slain in the interest of anatomical and pathological science. Who can doubt the benefits derived from vivisection when the experiments of Ferrier, Koch, and others are so full of instruction and help to the medical and surgical practitioner? Through the aid of the great mass of facts which vivisection has given to science, the physicians of to-day have achieved their most notable triumphs over disease and death. The operations through which these facts were reached were not performed from cruelty and blood-thirstiness but from a most benevolent and commendable spirit—the desire to meet the enemy of "gods and men." death, with the best weapons, the greatest skill, the highest knowledge that may be achieved.

The people who raise the cry against vivisection overlook many other outrages performed on their beloved beasts. What right has man, for instance, to keep that noble animal, the horse, in captivity, to urge him to his task with lash and spur, to mutilate him with brand and crop? What right has he to make the bullock his slave, to slaughter him for food, to rob the young calf of his mother's milk? I doubt if one of these reformers would forego his or her juicy sirloin because the animal that furnished it was butchered,—even though well assured by a thousand examples that vegetables alone will sustain life.

As for the suggestion that condemned criminals supply the place now filled by dogs, monkeys and frogs in the dissecting room, *Knowledge* playfully observes:

> **In another column will be found a paragraph taken from our contemporary, The Medical Press and Circular, and containing a suggestion which is perfectly charming in its simplicity. It emenates from a lady who is so gravely exercised on the subject of vivisection of the lower animals as to propose that physiological experiments on them should be absolutely and entirely put down by the strong arm of the law, and that condemned criminals (!) should be substituted for them by the experimenter. "One day," says the veracious American legend, "Billy come home holdin' a little mole by the tail wich some boy had cot and give him, and it was alive. Wen my sister see him she said, O, you crewel, crewel boy, thro it in the fire this minit!"**

SENSE-ILLUSIONS.

Mr. R. A. Proctor, following the incentive given by Prof. LeConte's recent paper in the *North American Review*, discusses some illusions of the senses in *Knowledge* for July. Mr. Proctor's genius seems well-nigh universal and he seldom puts pen to paper without having something to say worth the saying. In the paper referred to he shows by a series of simple experiments how untrustworthy the senses are under novel or normal conditions. One would think, for instance, that the sense of touch, in those matters wherein it serves as the medium of apprehension, cannot be deceptive: yet if we cross the tips of the first and second digits, and touch objects with them thus crossed, it will be discovered that the sense of touch is not always reliable. Many other like experiments could be suggested. Several of these are used by conjurers, such as the following: Take a silver half dollar and, holding a companion's hand with the palm upward, press the edge of the coin strongly into the middle of his palm for a few seconds: if you then deftly remove the coin unperceived, at the same time closing his hand firmly, it will be difficult to convince him that the coin is not in his grasp. This is a very amusing "trick" and is frequently performed by the conjurer to the astonishment of his audience and the innocent youth victimized. To the same degree is it possible to confuse the sense of heat and cold. If one hand is placed in a basin of hot water and the other in a basin of ice-water, when both are withdrawn and plunged simultaneously into a basin of tepid water the "feelings" of the two hands give the lie to the assertion of sight that they are both in the same basin of water. The hand that was in the ice-water finds the tepid water quite warm while the hand that was in the hot water disputes this and declares it to be quite cold.

But the sense of sight is, perhaps, the most deceptive of them all; notwithstanding popular notions on the subject. Every lawyer knows the impossibility of finding two witnesses of an event who tell the same story. Indeed this fact, the rarity of agreement between independent observers of events, has led to a distrust of witnesses who repeat the same story without variation or disagreement. In a recent magazine there is a picture of three men walking along a pavement. They are receding from us following each other. The one in front appears of gigantic size, the next somewhat smaller and the hindmost quite diminutive. It seems ridiculous to assert that there is no difference in their sizes yet they measure the same. The illusion consists in drawing the surroundings in proper perspective and abandoning perspective in depicting the figures.

Thus it is not a mark of superior wisdom to rely upon the verdicts of the senses indiscriminately. It might be justly suspected that many of the marvels that we are accustomed to hear testified about so volubly are merely "Illusions of the senses."

The subject of a public park for Kansas City will attain as much importance shortly as any other question of municipal progress. Any one who will drive to the ford on Brush creek, south of the city, and turn eastward down a wood-road for a few hundred yards, will reach as pretty a piece of sylvan scenery as may be found anywhere. There is a mimic water-fall, with crystal-clear water and unfailing spring. Rocks abound and quiet pools and shady trees. Below the little cataract is a bayou which could be easily given the aspect of a natural lake. Around are highlands and lowlands giving variety to the landsbape.

If it is not possible to get ground enough for a park on the river-front, (on the bluffs east of the city), at a fair valuation there is no spot around Kansas City more suitable than the one on Brush-creek.

"The Henry Electric Motor, of this city, of which so much was expected, is taking a rest in the torpid state. It was to be in practical operation for the Inter-State Fair, to be held next week, but as is always the case in such failures, the manufacturers of the special car required for the purpose failed to come to time, and now we are to have another interregnum in the date of the opening exhibition. The truth of the matter is that some of the projectors and stockholders are also interested in a new to-be-patented flying machine, and you know the old adage about having too many irons in the fire."

The above clipped from the *Eledtrical Review* is quite amusing as an evidence of the tendency of very wise men to be gulled by a cleverly written hoax. The Henry Electric Motor is not "torpid" and the flying-machine company was the creation of an enterprising and ingenious young man on the staff of a local newspaper. The same reporter has successfully palmed off several new stories of the same sort lately, including one on a perpetual motion machine and one on an air engine which is to pump its own air into the receiver. The Electric Railway Co. referred to has secured the switch of the Ft. S. & G. from the Rosedale road to the Fair Grounds and their new car will shortly be here and a final test made of Mr. Henry's invention.

The eighteenth annual meeting of the

Kansas Academy of Science will be held at Manhattan, Tuesday, Wednesday and Thursday, November 10th, 11th and 12th, 1885. The business meeting will be at 3:30 p. m. of the 10th, at the Agricultural College, where the day sessions of the Academy will be held.

The citizens of Manhattan offer to entertain at their homes those who prefer such entertainment, and reduced rates are secured for those who prefer to accept the accommodations of the hotels. Free carriages will be provided for the transportation of visiting members to and from the trains, and between the Town and College.

Those expecting to present papers are requested to announce their titles to the Secretary, at Manhattan, AT ONCE, in order that they may be properly ar-arranged in the programme.

The conclusion of "A Chinese Columbus" was crowded out this month but will appear in the November number.

It is to be hoped that patrons of the Review will send in their subscriptions without further delay. We intend that the West shall have a first-class magazine but this intention must meet a more substantial appreciation than fine phrases and flattering testimonials.

The Review intends shortly to commence a thorough and scientific investigation into the sources of water-supply for Kansas City; the facts and conclusions to be applicable to the general sciences of hydrostatics and hydrology as well as to the purpose of the special enquiry.

CORRESPONDENCE.

CHANGE IN THE NEBULA IN ANDROMEDA.

Editors Kansas City Review:

The phenomenon now taking place in the Andromeda nebula is being watched at this observatory with interest. It was first detected by Dr. E. Hartwig in Europe, and by W. H. Numsen in Baltimore, about Sept. 1st. It consists of a bright star-like nucleus in the centre of the great nebula, that has very recently developed. We observed this nebula on August 24th, and no trace of a nucleus was seen, but on Sept. 4th it was a conspicuous object. Three theories may be advanced concerning the apparition. It may be a new star that has formed on the farther side of the Nebula, and shines through it, or a new star on this side, or a new sun in process of condensation from the mass of the Nebula itself. The first two hypotheses are most improbable, while the latter is reasonable and seems in accord with what little we know regarding the sideral heavens, and their processes of evolution. If the Nebula is condensing into a sun, it is the most stupendous spectacle ever beheld by human eyes. It has been granted to man to witness creative action, and look upon the formation of a sun. The distance of the nebula is unknown, but in all probability, that ray of light which now enters our telescopes from this incandescent nucleus, has been on the flight hither for more than one thousand years, with a velocity of 186,000 miles each second. The nebula has a large angular diameter, hence, when we contemplate its distance we cannot fail being impressed with its real and mighty dimensions—hundreds of times greater than the expanse of the Neptunian orbit—and when this bulk of atoms combine and conduse into a liquid sun, the evolution of energy in the form of heat and light, takes place on a most magnificent scale. Yet so distant is the grand illumination that only a few rays reach the earth to be eagerly caught up by a spectroscope in the hands of some student seeking to learn what elements there are in an incandescent state. In 2,000 years from now it will be regarded as the star of 1885.

EDGAR L. LARKIN.
New Windsor, Ill., Sept. 22, '85.

TWO NEW CHEMICAL TERMS.

EDITORS KANSAS CITY REVIEW:

It is the general accepted theory among scientific men now-a-days that almost all matter, whether elementary or compound, exists in the molecular state. Whenever molecules are spoken of, they are commonly characterized as simple or elementary, and compound. Now it seems to me that *two new terms* are needed in chemical nomenclature for expressing clearly and concisely the distinction between molecules of simple substances and of compound substances. Such terms may exist but I have not seen them. The terms I propose to introduce may be in use but I have never met with them. They are formed on the analogy of homogeneous and hetereogeneous, viz: *homatomic* and *heteratomic*. As illustration, I would say the molecules of hydrogen are homatomic, but the molecules of water are heteratomic.

If these terms are unnecessary, or old, I would like to know from some good authority; if new and useful as well would I like to know.

PROF. T. BERRY SMITH,
Pritchett Institute, Glasgow, Mo.

SCIENTIFIC AND INDUSTRIAL NOTES.

FORMATION OF COAL.

The American Cyclopedia admits that there is no generally accepted theory for the formation of mineral coal; and in confirmation, quotes six partially recognized theories and the arguments of their endorsers and advocates. It is in order, therefore, to offer for consideration theory No. 7, which proposes to demonstrate, analogically, to the satisfaction of at least one of your readers, that the great coal beds of Pennsylvania were formed by chemical action of the elements in solution and suspension in the water, and that these elements came direct from the interior of the earth by volcanic action.

The most popular scientists of the day agree upon the theory that "mineral coal is of vegetable origin," requiring millions of years to grow the vegetation, and a constant up and down tilting of the earth's crust, to grow it, and cover it up; and yet they have never agreed fully upon the mode, in detail, by which the series are repeated, time and again, in such uniformity. They ignore the true solution of the question, chemical analyses, and pin their faith upon the incidental deposits of fossils, as their guide to the age of these several formations. They generally agree, however, that the carboniferous age did not commence until after the deposit of the sedimentary formation called by Rogers the Seral Conglomerate or Formation No. XII. of the Pennsylvania nomenclature; and that any traces of coal below the seral conglomerate are "abnormal," "sporadic" and "illegitimate."

Now, we do find good coal fields in the lower formation, in series of the same uniformity, and quite as free from impurities as the best seams in the carboniferous formation No. XIII. This is not theory but fact; hence the necessity for a new theory, to give this legitimate coal an honest parentage.

When we consider that all the elements found in the earth's crust originated either in the atmosphere or in the mass which forms the interior of the earth, we must certainly look to the interior magma for the most of the metallic bases of the rocks, including stone coal.

Neither hydrogen nor carbon are very abundant in the atmosphere; but they are abundant in the entire crust, as the volatile portion of the vast beds of coal, as petroleum, and in numerous gaseous forms, as natural gas and the fire damp of coal mines. The recognized series of hydro carbons are numerous.

The chemists of the latter part of the eighteenth century have left their records of the discovery of the fact that metallic bases immersed in some of the hydro carbon may be entirely surrounded by oxygen without oxidation, unless brought into atomic contact by agitation; and experiments within the past few months have demonstrated that metallic carbon may be heated in atomic contact with any oxygen, without combining, until moisture is introduced in some form.

The best authorities in chemistry recognize both hydrogen and carbon as metals; therefore, inorganic. Now, grant that these elements, in the form of hydro-carbons, have their origin in the interior magma; then by oxidation of the metallic bases we produce combustion and decomposition of the hydro-carbons, setting free the hydrogen to mingle with the oxygen of the atmosphere to form rain, while the carbon and oxygen will form carbonic acid, to be brought down from the atmosphere by the rain into the water on the face of the earth. Whenever the crust of the earth becomes thick enough to obstruct the free passage of these gases and other products of oxidation, combustion, condensation, and decomposition, paroxysmal and volcanic action will result, and the igneous mass resulting from said oxidation and combustion will be outpoured upon the surface to thicken the earth's crust. If poured out in the atmosphere to cool slowly, to form crystallin rocks; if injected from below into the wate basins, to become disintegrated, the coarser portions to come down as conglomerat rock, while the finer parts will dissolve i the acidulated water or be held in suspension in the water as mud, to come down a chemical compounds, precipitates, and mu slates and shales.—Titus E. Emery in Coa Trade Journal.

ANCIENT METHOD OF WASHING GOLD.

The gypsies of the Banat in Austro-Hungary, in washing the gold from the sands o the rivers and plains, still use a very antiquated system, out of which no doubt th modern systems have grown. It is practice now by the gypsies as it was by the Roman in the same country. It consists in nothin more than pouring the sand, mixed wit water, over an inclined plane, the heavie particles of the gold remaining upon th surface, while the light impurities are washed away. Sometimes the inclined plane i covered with woolen cloth, to which th gold adheres; wanting the cloth, the gypsie now and then use for the same purpose th more ancient substitute of a fleece. Th manner of collecting gold dust on sheep' fleeces upon inclined plains is represente in the curious old works of Agricola. I the rivers of Colchis, the custom is still retained of placing sheep skins in the beds o the Phasa and other auriferous streams to collect particles of gold, hence the dedication of such fleeces to the gods, and the fabulous history of the Argonauts, as far as it related to the Golden Fleece. The more common manipulation among the gypsies of the Banat, as far as the gold washing is concerned, is performed by means of a plank of a lime tree, six feet long and one and a half inches thick. At the upper extremity is a small trough, and across the board are about a dozen grooves or furrows cut in the wood. The plank is set at an angle of 45 degrees. The sand is put into the trough at the upper end, and thence, by plenty of water washed down the sloping board. The gold dust falls into the grooves, whence it is scraped or brushed off. It might be supposed that a great deal of gold is lost by the careless method, but long experience has made the gypsies very expert; they know how to distinguish the rich and poor sand, and a careful examination of the tailings proves that hardly a particle of gold escapes them during the operation. The gold is in the form of a fine dust, the sand containing it is mixed with black particles of highly magnetic iron, garnets and mica. —London Mining Journal.

THE CREEPING OF RAILS ON THE ST. LOUIS BRIDGE.

The rails forming the double line of railway over the St. Louis bridge move in the direction of the traffic at the rate of more than a foot a day. This creeping occurs only on the bridge proper (1600 feet in length and rising five feet from each abutment to the center), and on the eastern approach (2500 feet long, gradient 1 in 66, and consisting of short girders on iron columns). Various methods have been tried to keep the rails in place, but without success, and the practice is now to leave the rails to creep, cutting out and filling in as may be required at the butments and at the foot of the east approach. This has to be done many times a day at each place. In the twelve months ending August 1884, the rails of the north line traveled 400 and 401 feet respectively up the approach, and 268 and 260 feet respectively over the bridge, while the rails of the south line traveled 414 and 415 feet respectively down the approach, and 240 and 239 feet respectively over the bridge. The ratio of westward to eastward movement on the bridge is 1,099, and this is exactly the ratio of westward to eastward tonnage. On the approach this proportion does not hold, the result being affected by the heavy gradient. An analogous phenomenon is the creeping of bridges on their supports. If a bridge have its two ends similarly mounted, when a train comes upon it from the right this end is at once pinned fast by the weight of the train. The deflection caused by the train lengthens the bottom chord and shortens the top chord of the truss, so that if it is supported at the bottom chord, the left end moves to the left, and if at the top chord, the left end moves to the right. As the train passes off at the left end, this end of the truss is pinned fast while it recovers its shape, and consequently if the truss is supported at the bottom chord it will have moved bodily to the left, and if at the top chord to the right.

The author considers the various explanations already offered to account for the creeping of the rails, showing them to be either insufficient or unsatisfactory. His own explantion, the result of accurate observation, and supported by interesting experiments described in the paper, is that there is a wave-motion of the rail independent of its supports, such a wave occuring under each car and moving with it, giving a slight forward motion to the rail everytime a given section is brought down upon the support. The total movement for one train will thus vary with the number and weight of the cars. On the bridge, the rails (flat-bottomed) rest on pillow-blocks of gunwood 5¼ inches thick, held in position between longitudinal channel-irons. These blocks are 17 inches long and spaced 19 inches apart end to end. The wave-motion of the rail is due to the elasticity of these supports. The rail is held fast on the supports by the load, on its extended side. This causes it to measure its length across the bridge on its extended side, or it may be said to roll itself across the bridge on its extended side. If, instead of being supported at the bottom flange, the rail were supported at a point above the neutral axis, there will be a tendency for it to creep backward, that is, against the direction of the traffic, owing to the compression of the upper side. There would, however, also be a tendency for it to move foward, as the neutral axis when thrown into waves is longer than when at rest. Again, if the rail were supported from the upper surface, the creeping would be backward. There is, therefore, between the neutral axis and the upper surface of the rail, a line along which, if the rail were supported, there would be no tendency to creep either forward or backward.—[T. B. Johnson in Journal of the Association of Engineering Societies.

WHERE TORNADOES MOST ABOUND.

Sergeant Finley's elaborate and valuable report on the tornadoes of 1884, recently issued by the Signal Service Bureau, illustrates with charts the fact that these startling and destructive phenomena, like most hail and thunder storms, occur in places lying southeastward of a large barometric depression or "low center." The observations which form the basis of this report, says the New York Tribune, confirm various previously accepted theories regarding tornadoes, such as their occurence mainly in the afternoon, their generation by the conflicting polar and equatorial air currents, and the development of considerable electricity in connection with them. But the discovery just mentioned is of more practical service than any of the other facts brought out in indicating the possible outbreak of tornadoes in a given region. Inasmuch as these storms occur anywhere from 200 to 800 miles from the low center, a large area may be imperiled at one time, and the suddenness of formation, the narrowness of track and the brevity of the period of havoc make it impossible to foretell precisely in what localities within this broad region the outbreaks will occur; nor can any one say definitely how plentiful a brood of destroyers will be hatched, though the conditions favorable to their birth are distinctly recognized. Yet the importance of even the slightest valid warning will be appreciated when it is known that in a single tornado season of a few months over 1000 lives may be lost, 2500 persons injured, and property valued at over $13,000,000 destroyed. Such at least was the case last year; the destruction wrought in one day, September 9, being estimated at $4,000,000.

Sergeant Finley's tables show that the south suffered to an exceptional degree from this cause in 1884. Georgia, Alabama, and the two Carolinas were visited by one-half of the 180 tornadoes reported from the whole country. That particular district is more liable to such visitations than many other parts of the Union, but not so much so, on an average, as another tract embracing most of Kansas and portions of Missouri, Nebraska, Minnesota, Iowa, Illinois and Indiana, which, together, experienced only thirty-five last year. A schedule once prepared by Sergeant Finley, who has long been studying this subject, showed the distribution of tornadoes for the five years ending with 1880. This gave the four States first named 8.5 per cent. of the whole number, and 28.7 per cent. to the other seven. Another tabulation made by the signal service, including about 600 tornadoes, and covering eighty-seven years, still further established the fact that the northwestern tract already described is the chief sufferer from these afflictions; and the eastern cotton States come second. Texas is the region of next greatest frequency.

No theory is contained in Sergeant Finley's report to explain this exceptional prevalence of tornadoes in the south last year. An analysis of the returns, however, shows that a large proportion of last year's crop was produced in the spring season, while yet the low centers, which at intervals of several days are forever crossing the country in an easterly or northwesterly direction, were taking a somewhat more southerly course than in the summer months—usually the period of greatest frequency.

Thus, more tornadoes occurred in February last year than in July; although they were confined to two days in the former month, and distributed among fifteen in the latter. The tornado season this year did not fairly open until May; the greatest abundance was produced in June and July, when the low centers, mostly born in the middle plateau of the Rocky Mountains, were traveling along or north of the line of the great lakes; and a great majority of the attendant tornadoes have been experienced in the northwestern area already indicated as most liable to be thus visited. Still, without extending one's observation beyond these two years, it would be hasty to assume that the distribution of tornadoes any year depends upon the time at which the season opens.—Jour. of Com.

THE LONGEST BRIDGES IN THE WORLD.

The Moniteur Industrial gives the following as a list of the twenty-six largest bridges in world:

	Feet.
Montreal bridge, over the St. Lawrence....	8789
Brooklyn, over the East river..................	5989
Rapperswyl, Lake Zurich......................	5333
Volga, over the Sysran, Russia...............	4947
Moerdyk. Holland..............................	4927
Dneiper, near Jekaterinoslaw, Russia.......	4213
Kiew, over the Dneiper...........	3607
Barrage bridge, Delta of the Nile............	3353
"Kronprinz Rudolph," over the Danube, at Vienna......	3266
Dneiper, near Krementchough, Russia.....	3250
Bommel, over the Meuse, Holland...........	3060
Two Bridges of Rotterdam, over the Meuse.	2833
Mississippi bridge.............................	2588
St. Louis, over the Mississippi...............	2574
Saint Esprit, over the Rhone, France	2460
Kinlinbourg, over the Rhine, Holland.......	2347
Cincinnati, over the Ohio......................	2233
Chaumont Viaduct, Valley of the Suize, France	2000
Menai, England...................	1957
Cubzac, over the Dordogne...................	1817
Varsovie, over the Vistula..................	1693
Iron bridge, at Bordeaux, over the Garonne	1667
Stone bridge, at Bordeaux, over the Garonne	1623
Beaucaire, over the Rhone....................	1460
Tours, over the Loire..........................	1457
Alexandre, at St. Petersburg.................	1350

Of the above the sixth on the list has recently been opened, the Rapperswyl bridge is merely a pile structure and is only thirteen feet wide; the Sysran bridge over the Volga carries the Orenbourg railway, and was only finished in 1880; it has thirteen spans, and is raised 130 feet above the level of the river; it cost 13,500,000 francs.

The Moerdyk bridge carries the Anvers and Rotterdam railways over the Meuse, which is about 8,800 feet wide at this point, and has been reduced by dykes; it has fourteen spans of 328 feet each. It was commenced in 1868 and finished in 1871; it cost about 12,000,000 francs.

The above list is given as printed, but the compiler in the Moniteur has in his table wholly ignored many longAmerican bridges. A complete list of the length of modern iron bridges is not just now accessible, but among the omissions may be noted:

	Feet.
B. & O. bridge, at Havre de Grace...........	6000
Wooden bridge at Columbia, Pa.............	5366
Louisville railroad bridge, over the Ohio...	5218
Cincinnati Southern railroad bridge, over the Ohio..	3950
Havre de Grace bridge, over the Susquehanna	3271
Dauphin bridge, over the Susquehanna.....	3590
Monongahela bridge, near Homestead......	3000
Plattsmouth bridge, over the Missouri......	3000
Quincy bridge, over Mississippi.............	2857
Omaha bridge, over Missouri.................	2750
Keokuk, Ia., bridge, over Mississippi.......	2008
La Crosse bridge, over Mississippi...........	1672
Boonville bridge, over Missouri.	1651

To the above many other long bridges could doubtless be added, were the data at hand. The longest bridge in the world was the late Tay bridge which was 10,320 feet in length, and the Forth bridge now under construction is to be about 9,200 feet long. Although it does not strictly belong to the class in question, the New York elevated railway is a continuous iron truss bridge, and the aggregate length is thirty miles—Journal of Commerce.

EDIBLE EARTH.

Clay is composed of silica, alumina and water, colored by metallic oxides. Some samples of edible earth are composed as tripoli is, of innumerable microscopic and fossilized shells of fresh-water infusoria. How men came to have recourse to such aliment may be without evidence; but similar circumstances have led to like results in countries remote from each other. The Otomacs, a people of Southern America, take regularly a pound or more per day of a rich clay which appeases hunger without injury. Among the Indians on the border of the Amazon clay forms a part of their food, even when other aliments abound.

[illegible] They also make prettily moulded figures [illegible] and sweetmeats. M. H[illegible] showed at Amsterdam in 1883 specimens of edible earth in its natural state and prepared, also a few little figures, imitations of fruits and fancy objects. The flavor of these delicacies is empyreumatic, and the mild, slightly aromatic sensation which follows the first taste arises from the earth itself, to which no condiment is added. The early origin of the custom of making various alimentary substances into human shapes is obscure.—[Science Monthly.

A BLACK INVENTOR.

A recent issue of the Montgomery (Va.) Messenger contains the following:

Minnis Haden, a worthy colored blacksmith of this place, has lately invented one of the most ingenious and valuable devices we have ever seen. Being a poor man and unable to employ a hand as striker, he cast about how he might do by machinery what heretofore could be done only by the hand of man. The result of his cogitations is a piece of very simple machinery by which the striking hammer is easily and effectively worked by his foot, while he has both hands free to hold his iron and use the small hammer. To a listener the blows come as naturally and as rapidly as if there were two men handling the hammers in the old-fashioned way, but there is a difference. The machine, by an easy motion of the foot on the treadle, strikes a harder blow than any man can strike, and can be made at will to strike as light a blow as may be needed. But the use of this simple and easy device in the blacksmith's shop is not half. It can be just as easily used and will find a large field of usefulness in driving a drill for blasting rock. In its present form, without any change, one man can drive a drill perpendicularly as easily as three men now do the same work. By a very simple and easy plan hammers can be provided and attached, which will make it just as easy to drive a hole horizontally or at any required angle, and the whole work can be done by one man. The machine is portable and need not be very heavy. Mr. D. W. Frizzell has become a part owner of this invention. A caveat has been secured, and Mr. Frizzell is expecting to receive a patent as soon as the papers are made out.

A MARVELOUS GOLD FIND IN MICHIGAN.

The recent gold discovery near Ishpeming, Mich., proves to be of marvelous richness—a veritable bonanza, vouched for by that reliable authority, the Marquette Mining Journal, the editor of which visited the "find" and publishes a detailed account thereof in the last issue. The vein is located on section 35, township 48, range 28, and has been explored about 800 feet. The first discovery was made June 14th, by W. L. Jones, an assayer of Ishpeming, but being on land owned by the Lake Superior Iron Company was kept quiet until terms could be made with the owners, failing in which the vein was traced to land adjacent, which has been leased by Mr. Jones and his friend. The richness of the vein was unknown until the second week of this month, when a single blast in a pit 6 feet in depth revealed a width of 4 feet of "sugar quartz," carrying free gold and assaying $20,000 per ton. The quartz is very brittle, crumbling easily under the pressure of the fingers. The Mining Journal's account says: "The rock is of wonderful richness, and it was the writer's privilege to secure from the vein, with the aid of a hammer and drill, a number of pieces carrying free gold. The quartz is well mineralized, and, unlike other gold bearing rock, carries very little silver, the gold being nearly pure The average value of the quartz cannot be accurately stated, but many specimens which have been taken from the opening described, would give an average of from $20,000 to $40,000, and even more, per ton; but this cannot be called the average value of the rock. That it will go up in the thousands is, from indications, beyond a reasonable doubt. With such a surface showing, the property may yet become more valuable even than is now thought by the most sanguine. It is certainly the richest thing yet found in the upper peninsula. The Nelson House 'lay out' of new specimens from the new find was duly examined and admired. It is, indeed, a magnificent showing of richly mineralized quartz, many of the pieces being thickly studded with virgin gold, which appears all through them in a variety of beautiful forms. Much has been said and written to prove that this region contains rich deposits of gold, but the best argument in support of this proposition—an unanswerable one, in truth—is to be found in this group of beautiful specimens, all of which were taken from a sinking in the vein less than six feet from the surface."

It is hardly necessary to add that the people of the upper peninsula are greatly excited over the discovery, and the prospecting now going on will likely develop other rich deposits.—The Age of Steel.

KENDALL'S ELECTRIC GENERATOR —A COAL BATTERY.

A report in the Engineer, states that at the International Inventions Exhibition, Mr. J. A. Kendall, of North Ormsby, Middlesborough, exhibits an electric battery, which appears to be a decided step in the direction of producing electricity from the oxidation of coal without the intervention of a steam-engine. The battery is based upon the well-known phenomenon of hydrogen passing through platinum at a red heat, two platinum plates being used as the poles, one exposed to hydrogen and the other to oxygen. These plates are arranged in the form of concentric tubes closed at one end, and are separated by a fluid medium of fused glass. Hydrogen gas is continuously supplied to the inner platinum tube, while the entire apparatus is maintained at a high temperature by means of a furnace fed with coke or liquid or gaseous fuel. The absorption of hydrogen by the platinum is accompanied by electric generation, and the current is led away by wires connected with the platinum tubes. It is curious, however, that, so long as the two platinum tubes are not connected by a metalic circuit, the passage of the hydrogen is slow, but that, as soon as the electric circuit is completed, the rate of flow is suddenly increased and is steadily maintained at the higher amount. In the case of a group of cells or battery, the same gas-furnace may be used to heat the series. The cells are connected for quantity and intensity as in the voltaic battery. The electro-motive force of a cell is given by Mr. Kendall, as about 0·7 volt. This is of course, much less than the theoretical electro-motive force of a hydrogen and oxygen couple, and the remaining energy evolved by the combination appears to be developed in the form of heat at the surface of the oxygen plate, and serves to keep up the temperature of the apparatus. In the action of the battery, the hydrogen in passing through the inner tube is, so to speak, filtered off from any gases with which it may be mixed. The residual combustible gases, if any, when drawn off by the escape jet, can be utilized as fuel for the furnace. This is a very valuable feature, as it enables the battery to be worked with Strong-producer gas, consisting mainly of hydrogen and carbonic oxide, and to be arranged in a very compact way, the spare heat left from heating the cells being available for working the producer. Mr. Kendall proposes to employ it for a variety of purposes—for example, the driving of electric launches, and so on. With the new generator, all that is required to maintain the working is a supply of fuel and a little water. The inventor estimates that a ton of coke used in heating the battery, including the hydrogen producer, will give at least three times the electrical energy that would be produced by the same quantity of coke used in working a steam-engine and dynamo. It is also hoped by the inventor to develop the new process of electric generation for lighting purposes. Houses can in this way be lighted by incandescent lamps by means of coal-gas supplied to the premises; and larger centers illumination could be economically worked by the use of ordinary fuel, such as coal and coke.

THE NEW STAR IN ANDROMEDA.

The importance of the latest news gathered from the starry heavens has, apparently, been hardly comprehended, even by many of the astronomers themselves, remarks the New York Sun. To say that a new star has appeared among the countless brilliant specks of light that enliven the sky at night does not seem very startling, especially when the new star is so faint as to escape all eyes except those that are aided by the telescope. The news assumes greater interest, however, when it is considered that this new star is a sun, as large, probably, as our own sun, which has suddenly sprung into being in the depths of space, lighting up with its radiance a corner of the universe hitherto buried in the gloom of perpetual night.

But the most interesting fact about the new star in Andromeda is that it appears in the centre of a nebula, thus giving some countenance to the assertion which has been made that it is a marvelous example of the process of nebular evolution by which our own solar system is believed to have been produced. If this is so, however, we have here an instance in which the exceeding slowness of development assumed in the Hebular Hypothesis is replaced by a sudden bound from the nebulous to the solar condition. It appears that early in August certain observers saw a singularly bright spot in the Andromeda nebula which, however, was clearly a nebulous mass and not a star. In a month a star glittered in the place of the curdling fire-mist! Thus, if we believe that the new star really belongs to the Nebula of Andromeda, men have beheld the birth of a sun, not by gradual processes of contraction covering ages upon ages of time, but by a sudden spring into being, a burst of splendor in which the dull and scattered matter of a dimly glowing nebula has, almost in a twinkling, been transformed into a magnificently blazing sun, pouring the sudden light of day into the depths of space for millions of miles around it.

We can behold no spectacle on earth comparable with that. But a great deal of evidence will be required to convince astronomers that this is the actual history of what has occurred. They will probably sooner believe that the new star is the result of some collision of dark bodies in space, or of a terrific outburst of fiery forces in such a body lying between us and the Andromeda nebula, rather than that the step from nebula to sun could be so suddenly performed.

It is as yet all a great mystery, and the solution of it, whatever it may be, cannot fail to prove intensely interesting.

LABOR AND CAPITAL.

At the recent meeting of the American Institute of Mining Engineers in Halifax, President J. C. Bayles delivered a notable address on "The Existing Relations of Labor and Capital in the United States." Among other things Mr. Bayles said: "If the great problem of the improvement of the condition of the working classes is ever to be solved, we whose minds are trained to logical and purposeful thought, and who control the machinery of capital, must at least help solve it. For the idle and vicious there is nothing but the bitter fruits of idleness and vice. Those who break the inflexible laws of nature must expect to incur her inexorable penalties, and it would be a false and hurtful philanthrophy which should seek to avert them. But for industry and thrift there should be something better than our present industrial system gives. Arbitration should decide fairly and impartially the issues between workmen and employer, and some part of the profits of production should seek investment in ways which will react favorably upon the interests of labor. Participation should be established on an equal basis as the reward of faithful service, and co-operation should be promoted wherever and whenever it can benefit the wage earners. What may be our duty in these directions depends upon what may be our opportunity. There is, I fear, much of truth in the assumptions of the International Workingmen's Association that the laboring classes have nothing to hope for from the higher classes, but must fight out their own emancipation. If left to themselves they will undoubtedly fight to attain it; if intelligently aided and led they will work it out by peaceful and beneficent means. Such leadership and direction will come, if at all, from the men of education who are carrying on for capitalists or corporations the productive industries of the country. Each of us can contribute something to the solution of the great problem, and each may succeed in proportion to his opportunities in reducing the barrier which has been built up between the classes into which society is divided."

TELEGRAPHING TO AND FROM MOVING RAILWAY TRAINS.

The following details, from a late lecture on "Induction" by Mr. Frank Kitton, will serve to give a fair idea of the operation of the Phelps system of telegraphing to and from moving railway trains, which is now attracting attention.

In the first place, an insulated copper wire, suitably inclosed, is run along the railroad track midway between the rails. This may be called the secondary wire. Underneath the car, fitted with the necessary instruments, is placed an iron pipe (running the whole length of the car), in which is placed the primary wire, which passes first through the pipe, is then brought up into the car and strung along the top, after which it descends through the car into the pipe again, and so on, until the latter contains about ninety convolutions of wire, the ends or which are made to terminate in suitable telegraph apparatus. Every time, therefore, the telegraph operator in the car manipulates his key, he causes a strong current to flow in the wires contained in the pipe, which is placed at a distance of about 7 inches from, and parallel to the wire on the track. An induced current traverses the wire, which is led into the different offices, and is there connected with a similar set of apparatus. This apparatus receives the induced electric impulses and renders them intelligible to the receiving operator. The reverse of this is also true. When a dispatch is forwarded from any of the offices to the train, the currents traversing the wire between the rails are inductively taken up by the parallel wires under the moving car, and conveyed to the receiving instrument, to be there translated by the receiving operator.—Cin. Artizan.

THE AGE OF THE MOUNDS.

Dr. Cyrus Thomas, who is in charge of the division on mound exploration of the Bureau of Ethnology, has in the last three years obtained about 15,000 specimens of the handiwork of the mound builders, the study of which, with the survey of the mounds themselves and their surroundings, is gradually leading to a solution of certain archæologic riddles which a few years ago seemed unsolvable.

While some of the mounds are doubtless very ancient, others similar in character and equally interesting have certainly been built up since the advent of Europeans. A string of sleigh bells much corroded but still capable of tinkling, was found among the flint and bone implements in a mound in Tennessee, while in Mississippi, at the point where De Soto is supposed to have tarried, a Spanish coat of arms in silver, one blade of a pair of scissors and other articles of European manufacture were found in positions which indicated that they were buried by the original builders of the mounds.

In a Georgia mound two copper plates were found, upon which were stamped figures resembling the sculptures upon the Central American ruins. The workmanship is vastly superior to that displayed upon the articles of pottery, stone and bone found in the mounds, and their origin and purpose are not yet explainable. Aside from these plates nothing has been found to indicate a connection between the mound builders and the Aztecs or the Pueblos, while on the other hand, there are many reasons for not going beyond the Cherokees and their fellow red men of the Ohio and Mississippi valley to find the origin of these curious erections.

The purpose of the mounds still remains in some cases a mystery, but in others they are known to have been made sometimes for burial places, and sometimes as foundations for Indian villages, secure from the floods to which the low lands were periodically subjected. [Norristown Herald.

VIVISECTION OF DOGS.

A large number of dogs have lately been, and are still being cut up by some of the professors of surgery in Bellevue Hospital, New York, in a series of trials intended to demonstrate the feasibility of certain operations upon human beings. Nearly all of the persons shot or stabbed in New York are taken to Bellevue. In cases wherein the abdomen is perforated death usually results from peritonitis, or inflammation of the membrane which lines the abdominal cavity. In various diseases, too, peritonitis is the fatal climax. Surgeon T. Herring Burchard, chief operator in the emergency ward of this hospital, and lecturer in the clinics of Bellevue Medical College, has held a theory thas the mortality from this cause is needlessly high, and that many lives might be saved by the bold surgery of cutting open the body, removing the irritant matter, or even excising gangrenous portions of the bowels, and then trusting to antiseptic treatment for a recovery. He urged that whenever the dreaded inflammation became established to an extent renderin death nearly certain if nothing were done then the knife ought always to be plied This was a new and rather startling vie even in these days of bold surgery. It wa decided to experiment extensively wit dogs. These could be obtained in any de sired numbers from the public pound. Th work was begun last spring, and has pro ceeded steadily ever since. Over 100 do have already been used by Dr. Herring an others interested in the subject. They hav suffered the laying open of their abdome and the removal of sections of intestine see if they would recover. In a fair numbe of instances they have done so. The pra tice is defended on the ground that, coul the operation be found practicable in hu man beings, a great number of lives woul be saved by it. Especially would that b true in wars.

METEOROLOGY OF SEPTEMBER.

Prof. Snow, of Lawrence University, fu nishes his monthly weather report for Sep tember, from which the following is ex cerpted:

The entire absence of frost, which cha acterized this month, is not an exceptiona feature for September in Kansas. Nine o the eighteen Septembers of our record hav been equally favored. The average date o the first autumn "hoar frost" is October 1s and of the first "killing" frost October 20th The mean temperature of the month jus closed was below the average. The rainfal was almost double the average, and nearl the whole of it occurred during the fir week. The wind-velocity was twenty p cent. below the average, and the cloudine was nearly normal.

MEAN TEMPERATURE—65.43 degree which is 0.99 deg. below the Septemb mean. The highest temperature was 86 de on the 24; the lowest was 49 deg., on the 2 giving a range of 39 deg. Mean temper ture at 7 a. m., 59.43 deg.; at 2 p. m., 74. deg.; at 9 p. m., 64.00 deg.

RAINFALL.—5.41 inches, which is 1. inches above the September mean. Ra fell on 8 days. There were 4 thunder sho ers. The entire rainfall for the 9 months 1885 now completed has been 30.95 inch which is 2.26 inches above the average the same months in the preceding 17 years.

MEAN CLOUDINESS—41 per cent. of the sky, the month being 0.31 per cent. cloudier than usual. Number of clear days (less than one-third cloudy) 18; half-clear (from one to two-thirds cloudy) 2; cloudy (more than two-thirds) 10. There were nine entirely clear days and four entirely cloudy. Mean cloudiness at 7 a. m., 43.34 per cent.; at 2 p. m., 41.67 per cent.; at 9 p. m., 38 per cent.

WIND—S.E., 30 times; S. W., 24 times; N. E., 16 times; N., 8 times; S., 5 times; N. W., 4 times; E., twice; W., once. The total run of the wind was 8,611 miles, which is 2,140 miles below the the September mean. This gives a mean daily velocity of 287 miles and a mean hour velocity of 11.96 miles. The highest velocity was 43 miles an hour, on the 12 th, from 3 to 4 p. m.

BAROMETER—Mean for the month, 29.084 inches; at 7 a. m., 29,100 inches; at 2 p .m., 29.074 inches; at 9 p. m., 29.079 inches; maximum, 29.375 inches, on the 18th minimum, 28.731 inches, on the 7th; monthly range, 0.644 inch.

RELATIVE HUMIDITY—Mean for the month, 73.8; at 7 a. m., 85.5; at 2 p. m., 53.7; at 9 p. m., 81.8; greatest, 100, on the 6th and 7th; least, 8, on the 26. There were two fogs.

A valuable table showing the meteorological history of this month for seventeen years is added.

ASTRONOMICAL NEWS.

ASTEROID PALISA (250).

On September 4 a cable message was received at Harvard College Observatory, from Dr. Krueger, at Kiel, announcing the discovery of an asteroid by Dr. Palisa.

September 3.4120 Gr. M. T. R. A. 23h. 34m. 39.9s. Decl. —16° 9m. 35s.

Motion in R. A. —48s., Decl. S. 4m. 11th magnitude.

ELEMENTS AND EPHEMERIS OF COMET BROOKS, 1885.

The position of the comet, published in Circular No. 59, as secured at Harvard College Observatory on September 2, was, as stated, merely approximate. An accurate reduction of the observations is given below, together with Harvard positions on September 3 and 6.

September 2d, 13h. 53m. 6s. Gr. M. T. R. A. 13h. 42m. 28.24s. Decl. +36° 38m. 2.5s. Observer, Pickering.

September 3d, 13h. 10m. 59s. Gr. M. T. R. A. 13h. 47m. 43. 39s. Decl. +37° 6m. 13.8s. Observer, Wendell.

September 6th, 13h. 25m. 25s. Gr. M. T. R. A. 14h. 4m. 3617s. Decl. +38° 28m. 33.5s. Observer, Wendell.

From these positions the following orbit has been computed by Messrs. Chandler and Wendell:

ELEMENTS.

Time Perihelion Passage = August 17.75 Gr. M. T.

	°	m.	
Longitude Perihelion	=265	33	Mean Eq. 1885.0
Longitude Node	=200	34	
Inclination	= 54	05	
Perihelion Distance	=.7544		

It was not intended at first to publish this orbit, it being a rough approximation, and the data somewhat limited but the weather being generally cloudy, with no immediate prospect of further observation, it has been deemed best to make use of it for a finding ephemeris.

EPHEMERIS.

Gr. Midnight.	—R.A—			—Decl.—		Log. r.	Log.	Light.
	h.	m.	s.	°	m			
Sept. 7	14	10	14	+38	53.4	9.9329	9.9546	1.02
11	14	35	58	40	29.3	9.9521	9.9329	1.04
15	15	5	9	41	47.4	9.9723	9.9116	1.04
19	15	37	57	+42	38.4	9.9931	9.8918	1.04

Light on September 2 taken as unity.

CAN UNDERGROUND HEAT BE UTILIZED?

In an article by J. Starkie Gardiner, in the Geological Magazine for September, the above subject is presented with much novelty and interest. After describing the phenomena which prove that the earth's periphery is only a crust of solid matter floating on a molten mass, he asserts that this crust is more likely to be ten than fifty miles thick. He refers to the artesian well now being bored at Pesch, which has reached a depth of 951 meters, and states that the temperature of its water is now 161 degrees Fah., and that the boring will continue till a temperature of 178 degrees is reached. The obvious deduction is that the heat of the earth will ultimately be utilized by man in the place of costly fuel and furnaces. "It needs no seer," he says, "to pierce the not distant future, when we shall be driven to every expedient to discover modes of obtaining heat without the combustion of fuel, and the, perhaps, far remote future when we shall bore shafts down to the liquid layer and conduct our smelting operations at the pit's mouth."

INFLUENCE OF FORESTS.

Prof. Muttrich, of Berlin, has reached the following conclusion from his forest meteorological researches: 1. That the forest exercises a positive influence on the temperature of the air; 2, that the daily variations of temperature are lessened by the forest, and in summer more than in winter; 3, that the influence of the leafy forest is in summer greater than that of the pine forest, while in winter the tempering influence of the pine forest preponderates over that of the defoliated forest. An attempt to determine the influence of the forest on the mean annual temperature led to no sure results.

The correspondent of the London Times, in Rome, writing from that city recently, says: "An interesting discovery illustrating the commerce and the luxury of ancient Rome has been made close to Monte Testaccio and the English cemetery. The whole of that district to the west of the Aventine, outside the Porta Tregemina, was occupied by granaries and warehouses for the storage of imports of all kinds. Between the northern side of Monte Testaccio and the Tiber there still exist colossal remains of the great emporium built by Marcus Emilius Lepidus and Emilius Paulus, nearly 200 years before the Christian era. In the year 1868, a considerable portion of the quays was discovered, together with some 600 blocks, many of them of large size, of rare variegated marbles of all kinds, lying just where they were landed from the galleys which had brought them from Numidia, the Grecian islands and Asia Minor fifteen centuries ago. Now, in the course of the building operations in this locality, two warehouses have been discovered, one filled with elephants' tusks and the other with lentils. It is curious to find such products stored side by side, but as bags of lentils were sometimes shipped as ballast they may have served that purpose. The discovery would have been a very valuable one, if unfortunately, the ivory had not been much decayed."

A contributor to Cosmos suggests a curious optical experiment which may serve to show the principle of the telescope. If we cut out of black paper two similar figures—two crosses, for example—and place them, their extremities almost touching, at about three inches from the eyes, before a sheet of white paper, we shall see three crosses, the middle one being dark and completely separate. This phenomenon is explained by the simultaneous vision of the two eyes, and it is easy to show this by looking at the objects successively with one eye. The experiment becomes still more interesting when, instead of black figures, we employ complementary colors—red and green, for example. In this case we must use a dark background, and there will appear a white cross in the middle.

It has long been well understood that gold is the most universally distributed of metals, being found in all parts of the world, but most readers will probably be surprised at a statement recently made by Prof. A. E. Foote, of this city, to the effect that there is more gold in the clay under the city of Philadelphia, than would equal the entire valuation of the city. In 1812, men made sixty cents a day in washing the sands near Chester, on the Delaware river, where William Penn first landed, and quite recently several dollars' worth of gold in grains were taken from a well one hundred and fifty feet deep within twenty miles of Philadelphia.—Wood and Steel.

Experiments have lately been made with a diamond of 92 carats, which is one of the finest known outside of the royal or national collections. It is of wonderfully pure water, and is admirably cut with 64 perfect geometrical facets. Its value is estimated at $60,000. When exposed during an hour to the rays of the sun, it preserved for more than twenty minutes, in a dark chamber, a light sufficient to show the white paper that reflected its rays. The same phenomenon was exhibited, with somewhat less intensity, after having submitted the diamond to a powerful electric light. A very apparent phosphorescence was also produced by rubbing the diamond for a few moments with flannel.

Some quaint and queer mineralogical specimens were shown us by J. F. Brooks, of Tabernacle district. They were rocks, completely honey-combed with flinty cells of four sides, and gradually enlarging toward the surface. The flinty walls suggest the separation of the flinty from the lime or clay particles by crystallization. Some of the cells are filled with clay rocks. They were found by hoe and plow hands near the surface of the ground. The peculiar formation of the shell also suggests the possibility of their once having been the habitation of animalculæ akin, probably, to the coral builders. Who can solve the mystery? —Savannah News.

According to a paper read before the Philosophical Society, of Glasgow, by Mr. A. Willsamson, the total area of the coal fields of China proper is about 400,000 square miles. Both the Shansi and Heenan coal field are greater than that of the aggregate of the principal coal producing countries of Europe, and in other districts of North China the coal fields are said to be seven times larger than all those of Great Britain. The coal is of various descriptions, and it is said that iron ores are found in all parts in close proximity to the coal.

It ought to be generally known that a man's hat will serve in most cases as a temporary life preserver to those in danger of drowning. When a person finds himself in the water he should lay hold of his hat between his hands, keeping the crown close uner his chin and the mouth of the hat under water. The quantity of air contained in the cavity of the hat will keep the head above water for a long time—sometimes for several hours.

A relic of the great forests which once covered the south of Sweden was recently dug out of a bog at Kinneved, in the shape of a boat six feet in diameter, hollowed out of a log. The tree from which it was obtained must have been twenty feet in circumference. The wood, which was blue in color, was very hard, and the boat so heavy that two bullocks could not move it.

A sheet of ordinary paper warmed in front of a fire will, in a dark place, give a very decided electric spark upon the application of the knuckle, with a crackling sound. Place a sheet of gold leaf between two sheets of paper thus electrified, and pass a pencil point over them in a zigzag course, and a luminous flash, quite strong, will appear.

The new metal, "gallium," melts at 81.1 degrees Fahrenheit, becoming liquid when held in the hand. Its specific gravity is a little less than six, or about half that of lead. It adheres readily to glass when fused and forms a beautiful mirror. It tarnishes but slightly in the air.

French engineers have succeeded in finding water in the desert country of southern Tunis. At the depth of more than 300 feet they struck a current which rushed forth from the surface with such velocity as to carry hugh stones high into the air.

The manufacture of artificial ivory from bones and scraps of sheepskin is a new industry.

MISCELLANY.

PIGMY ANIMALS

"How is this for a pigmy elephant?" said an [illegible] taking a [illegible] from a clay model of an elephant [illegible] in his hand. "Yes, it is small," he continued, "but that is just the great point in its favor. See this bone," he continued, taking up a small object from a table—"the real bone of the elephant I am making a model of. It was the famous recently discovered pigmy elephant of Europe. Some months ago a party of French naturalists, rambling through Italy, came upon great quantities of these bones and identified them as those of a race of elephants that were pocket editions, so to speak. The largest were not as large as our sheep, and in the adult form, were much smaller than any of the baby elephants that have been exhibited in this country. Their young in turn were elephants in miniature, being about as large as a small cat, and could easily have been held upon the open palm. Herds of these pigmies were undoubtedly captured by early man, and if the circus was in existence then, we can imagine a rare entertainment. What a troupe of elephants could have been marshalled in! First would appear the great Mammoth, with its long coat of hair; then the Dinotherium, with its incurved tusks; the gigantic Gangesa, from India, with its head and enormous tusks, extending fourteen feet in front, and finally, last but not least, the pigmies and their young arousing the enthusiam of the throng of young cave-dwellers.

"The pigmies, as far as known, represented two distinct species, known to science as Elephas melittensis and E. falconeri, and their remains are found over a wide geographical area, showing that they had an extended range. In the second book of the 'Æneid' Virgil notes a tradition to the effect that Sicily was at one time a part of the mainland, and it is now believed by many that long ago Italy was connected with Africa by a neck of land and that Malta and other places, now islands, were a part of it. Over this ancient bridge the pigmy elephant is supposed to have made their way into Europe, where their tracks can be traced in many localities. In Malta most of the skeletons have been found, while others have been discovered in various parts of Italy, and among other remains in many parts of Europe. These were real pigmies, while the so-called dwarf elephants of to-day are merely elephants whose growth has been retarded in some natural or artificial manner.

"The pigmies, however, were not all elephants, as at this time pigmy horses roame the slopes and valleys of North America They were the ancestors of our presen horse, and their remains have been found i such quantities that more than twenty dif ferent kinds have been recognized. Th smallest of these pigmy horses was about a large as a fox, and differed considerabl from our present horse. It lived in wha has been termed the Eocene time, and i called Eohippus. Instead of walking on th tip of a single toe or hoof, as does the hors of to-day, it had four well developed toe and a rudimentary fifth. In a later bed o this same time is found the Orohippus, pigmy horse with four perfect toes in fron and three behind. A great many ages later in beds of the Miocene time, bones of th Mesohippus appear. Then the horse was a large as a sheep—equalling in size the pigmy elephant. Its feet were still divided a it had three toes and the splint of another in each forefoot, and three toes behind. Following this came other forms, a the Anchitherium; then the Hipparion, a large as a donkey; and finally the Pliohippus, with a single toe on each foot, is foun the direct ancestor of our great horse of to-day, in the feet of which, if one carefully examines, are to be found rudimentary splint bones that are the representatives of the toes that were fully developed in the ancient forms. In Yale College a very complete set of these strange horses, from the pigmy form of long ago to the horse of today, can be seen, the result of the researches in the far West of Prof. Marsh.

"A few months ago a pigmy whale was washed ashore on the New Jersey coast, and was sent to the National Museum. In appearance it resembled the enormous finback, but instead of being sixty or eighty feet in length, and weighing several tons, it measured only nine feet in length, and was accompanied by a baby pigmy that was little over a foot long. The pigmy whales properly belong in the Pacific Ocean, and are often seen on the California coast; but this specimen probably strayed around the Horn, and with perhaps a few companions was wandering about the Atlantic, or, as some one suggested, waiting for the canal through the isthmus for a short cut home.

"Among the birds there is a pigmy quail—a delicate little creature, so small that the ancient Chinese used it to warm their hands in cold weather, carrying a bird in each closed palm. Among the quadrupeds the pigmy deer is perhaps the most interesting, and when seen it seems a perfect antelope in miniature. It is the Cephalopterus pygmæus, and is confined to South Africa—a most delicate and fragile little creature, being hardly over twelve inches in length. The head is long and pointed, the ears short, and the horns like toy ones, and very delicate and slender, being less than two inches in height, highly polished, and jet black.

"Quite as much of a pigmy is the Sultana antelope, found in the hilly regions of Abyssinia. Its height at the shoulder is only fourteen inches; the horns are extremely thin and about four inches long. The young of these midgets of the hoofed tribe are beautiful little creatures, those of the antelope being about eight inches long when born, and with their soft-colored fur, delicate pipe stem-like limbs, large and expressive eyes, they are, perhaps, the most attractive of any of the minute animals. I have," continued the artist, "nearly all these interesting creatures in my collection, and when placed together they present a striking and interesting appearance, telling a story of the curious modifications to which the various forms of life are subject. I am going to make a model of each one for a private museum, and they are to be placed in contrast with the giants. Thus the pigmy whale will be placed beside the right whale, the small elephant next to the giant-mammoth, and so on. In this way the great extremes of life are shown at a glance."—N. Y. Post.

SUNDAY OBSERVANCE.

Constance, the Great, promulgated the first Sunday law, but the day itself in this decree of the Emperor was called the "Salutary Day." And how far away is this wicked ruler's view of the Sunday from our present Puritanical and superstitious view! I give you the text of the Decree:

> "Let all the judges and town-people, and the occupations of all trades, rest on the venerable day of the sun; but let those who are situated in the country, freely and at full liberty attend to the business of agriculture; because it often happens that no other day is so fit for sowing corn and planting vines, lest the critical moment being let slip, men should lose the commodities granted by the providence of Heaven."

The Sunday of the early Christians was not at all regarded as a religious day or as a holy day in any exceptional sense, and perhaps under Constantine was legally set apart as a day of rest, or rather as a fete day, in order to please the populace. So little regarded was it as a day of religious observance, that Sylvester, who was Bishop of Rome, whilst Constantine was Emperor, in order to give to the day greater solemnity, changed the name of the first day of the week from Sunday to "the Lord's day." This is the first intimation we have in history, that is authentic, that the early Church instituted the day to commemorate our Saviour's resurrection.

In the epistles of Ignatius to to the Philippians, it is stated, "that he is a killer of Christ who fasts on the Lord's day or on

Saturday;" and there is no little evidence to show that the Sunday was considered to be a day of relaxation, of joy, and rejoicing, rather than of gloom. The Pharisaical doctrine, which is now so prevalent, of keeping that day with strictness, was, among the Christians of this early period, counted to be a great wickedness.

We are told that in the fifth century, the Christians, after divine service, followed their daily employment. "It was not done" until the meeting or service was quite over, when they might with innocency enough resume them, because the length of time, and the number of hours assigned for piety, were not then so well understood as at present.

In the funeral oration for the Lady Paula, St. Jerome says, "She with all her virgins and widows, who lived at Bethlehem in a cloister with her, upon the Lord's day, repaired duly to the church or house of God, which was nigh to her cell; and after her return from thence to her own lodgings, she, herself, and all her company, fell to work, and everyone performed their task, which was the making of clothes and garments for themselves and for others, as they were appointed."

St. Chrysostom, patriarch of Constantinople, recommended to his audience, after impressing upon themselves and their families what they had heard on the Lord's day, to return to their daily employments and trades.

The Parliament of England met on Sundays until the time of Richard the Third, in the year 1483.

Many of the kings were crowned on Sunday, among whom were Rufus, Stephen, Henry II., Richard I., and John. Richard I., was crowned twice,—once in the beginning of his reign, and again upon his return from the Holy Land,—and both times on Sunday. The daughter of Henry II., was on Sunday crowned Queen of Sicily, at Palermo. King John was first inaugurated Duke of Normandy, and afterwards crowned king, each event transpiring on Sunday.

The first law of England made for keeping of Sunday, was in the time of Edward VI., about 1470. "Parliament then passed an act by which Sunday and many holy days, the feast of All Saints, of Holy Innocents, &c., were established as festivals by law. This provided also, that it should be lawful for husbandmen, laborers, fishermen and all others in harvest, or any other time of the year when necessity should require, to labor, ride, fish, or do any other kind of work, at their own free will and pleasure upon any of the said days,"

In the morning of Sunday, the churches and chapels were opened the after part of the day was devoted to rational enjoyments this was not confined to the Roman Catholics. The Waldenses and other separatist sects observed that order. John Calvin, himself a most narrow minded and intolerant thinker, and the real founder of modern orthodoxy, made no claim that the Puritanical observance of the Sunday was in accordance either with the teaching of Christ or the usage of the early Christians. He explicitly writes in his great theological treatise, "The Institutes:"

> "But it cannot be doubted that everything was abolished at the coming of Christ our Lord. For He is the reality, at whose presence all types vanish; the substance, at whose sight all shadows are forsaken; He, I say, is the true fulfillment of the Sabbath. Being by baptism buried—with him, we have been grafted into a share of his death, that, being partakers of the resurrection, we should walk in newness of life. Therefore, the apostle in another place says, that the Sabbath was the shadow of something future,—that in Christ is the body; that is, the solid, real substance, which in that place he has well explained. This is content, not with one day, but with the whole course of our life, until, being wholly dead to ourselves, we are filled with life of God. Far, therefore, from Christians ought to be the superstitious observance of days."

Luther, whom the orthodox so patronizingly quote as authority, called the strict observance of the Sunday an apostacy from Christ, and recommended that the people attended church in the morning, and then give the remainder of the day to recreation. The Catholic countries, and, indeed, all continental Protestants, observe the Sunday about in the Spirit which Luther taught.—Robert Laird Collier.

A BOOS-KE-TAN.

The Creek Indians of the Hickory Ground town or neighborhood held their annual "boos-ke-tan" last week. This is commonly called "busk," and is the occasion when all the Indians of a certain section, under a local chief, meet for the purpose of taking their "possan" or black drink. The ground is selected by the town chief near some running stream, and a brush shed is constructed in the form of a cross, one end to the north, one to the south, and the others to the east and west. The chief occupies the west end and his subordinate officials the ends to the other points of the compass. After everything is got in readiness, a committee is appointed to go out and bring in four round logs, which are placed with ceremony in the center of the arbor, the outer ends pointing to the four cardinal points, but all touching together in the center.

Fire is produced by friction, which is then placed in the center of this cross. It is estimated with a slow fire these logs will last four days, the usual length of the busk. After the black drink is made the women, who are fasting, dance around the fire, and from twelve o'clock to the middle of the afternoon take draughts of the medicine, which is a powerful emetic, and also wash their faces, hands and feet with it. When the women all get through the men join them, and they dance all night, the women wearing terrapin shells filled with gravel and bound together, with buckskin thongs fastened to their legs or ankles, which rattle and aid in keeping time in the dance. They sing their peculiar songs, interspersed with yells by the men, and it is wonderful the amount of labor that is endured during these exercises. The women are tastefully and brilliantly dressed and decorated with their finest clothes, ribbons and ornaments. The next day the men go through pretty much the same ceremonies, and take their medicine.

After this, on the third day, the women bring the children, who are made to drink. They are washed in it, scratched on the arms and legs with a scratcher of many points, so the medicine can the sooner penetrate. These scratchers are usually made of garfish teeth, or in the absence of those they are made by sticking numerous pins through a feather. After each class get through with their duties of drinking and dancing they are permitted to go to the stream and bathe, when they can return to the camp and partake of food and prepare for the dance at night. During all these ceremonies the women and children occupy one camp and the men another.

On the fourth day the ashes are all cleaned up, and each participant sprinkles some of it on himself, the fire is renewed, and then begins the final dance. The men all come in with sticks, in the ends of which are inserted four white feathers. With these they keep time in all sorts of motion during the dance. All this is the ceremony that has to be gone through with before any of the members are allowed to eat green corn, and is, properly speaking, the "green corn dance."

In some towns of old standing these ceremonies are kept up eight days with much formality and strictness. In Tookabatcha town there now exist brass plates that have been handed down from one generation to another, probably for hundreds of years. They are now in possession of old Captain Tookabacha Hajo, one of the finest looking old Indians I have ever met, and is said to be one of the best men throughout the territory. These meetings are not altogether for the purpose of taking medicine, but are productive of much good. The chiefs of these clans take occasion to call together all the young men and explain to them the laws of the country and exhort them to be obedient to these laws, to maintain friendship among themselves and neighbors, and all return thanks for the blessings of the past year and ask the Great Spirit to continue them for the year to come.—[Muscogee (I. T.) Cor. N. O. Times-Democrat.

ABOUT PERFUMES.

It does not follow nowadays, says the New York Sun, because a toilet perfume is made in France or any other foreign country, that it is superior in quality to one of American preparation. Such was formerly the case, but the art of making fine perfumes has been carried to such perfection of late years in this country that not more than one-eighth as much of the French preparation is sold in the United States to-day as was sold ten years ago. While the best American-made perfumes are equal in quality to the finest of the French, such could not be the case if we had not that country to depend upon for our essential oils. The flowers that lead as providers of popular perfumes for the handkerchief and toilet are the jasmine, violet, tuberose, rose, bitter orange flower and cassia. Combinations of these with ambergris and musk result in all the delicious perfumes that are used. These flowers, or most of them, are indigenons to the south of France. Cassia, the blossom of the cinnamon tree, comes from the East Indies, as does the tuberose. The oils of violet, tuberose, jasmine and other delicate flowers, being volatile, must be extracted in a peculiar manner, in order that they may be retained any length of time for use. The oils of these flowers are extracted and held by grease absorption. A layer of refined fat is spread upon a large wire sieve with small meshes. Upon this bed of grease the delicate petals of the odor-bearing flowers are scattered loosely. Then a layer of fat is spread upon the flowers, and then more petals, and so on until the sieve is filled. It is then covered up and subjected for ten or twelve hours to a temperature just below the point at which the fat would melt. Then the heat is increased until the fat becomes liquid and runs through the meshes of the sieve into a vat arranged to receive it, charged with the perfume of the flowers. The grease, holding the rare oils of the flowers, is then sealed in cans and is ready for market, which it finds all over Europe and in this country. The trade name of the grease is pomade extract. In preparing the perfumes for use the manufacturer treats the pomade with odorless alcohol. The alcohol becomes the affinity of the perfume held by the grease, and it readily leaves the latter and joins the spirits. The grease is still there, however. To remove it from the affiliated perfume and spirits the compound is subjected to a gradually lowering temperature until the grease congeals. It is then an easy matter to run the liquid off, and all that is left to do is to bottle it, cork and label it, and it is then ready for any lady's handkerchief. Bitter orange flowers, rose leaves, cassia and other perfumed flowers have fixed essential oils, which are obtained by distillation. The neroli oil of trade is obtained from bitter orange blooms. About $5,000,000 worth of toilet perfumes are sold here every year, the basis for the most of which is imported. In spite of the assertions that the blooms of Florida are as rich in fragrant oils as the French flowers, experimental distillation has not made the assertion good except in the case of the oil of bitter orange flowers. As to roses, in France 100 pounds of rose leayes produce dessert spoonful of essential oil. In America it requires a ton of leaves to produce the same quantity. Then, again, flowers can' be picked by machinery, and it is not at al likely that floriculturists in this countr could secure hands to gather their fragran blossom harvests for two cents a day, a they can in France. Cologne and toilet waters of all kinds have been so successfully prepared in this country during the pas few years that a large export trade in them has gradually developed. As colonge i simply refined, odorless alcohol, perfume with some essential oil of flowers, there i no reason why it should not be made a well here as elsewhere. All first class toile waters, with the exception of bay rum, ar nothing more nor less than perfumed cor spirits, which have received a medicin quality by the introduction of balsamic tonic properties. Genuine bay rum is ways imported. Nine-tenths of the stu used as bay rum is not bay rum at all, but mixture of the essential oil of bay with cor mon rum or alcohol.

REYNARD'S WAYS.

During the fall of 1869 I witnessed t very shrewd performance of an old fox th had given me the "dodge" for at leas half dozen times. I was a boy then, but I kept as fine a pack of dogs as Middle Georgia afforded. Two of my cousins, living near my father's, also kept a number of splendid hounds. We hunted together, and the sounding of one horn brought all the dogs together. We rarely failed to catch a fox if we could once strike his trail; but the one under consideration had succeeded in worrying us not a little. We always lost the scent at the same place. After running for an hour or more, and allowing the dogs to come very close on her, she would make the circuit of a small mountain, and start directly from that to another on the opposite side of the little creek, but the dogs invariably failed to carry the trail more than thirty or forty rods from the stream. Her bridge was a large pine log that lay across the creek, fifteen or twenty feet above the water. The banks were very high.

One fine frosty morning, after a race after her that terminated as all the others had done, it was decided that the next Monday morning—this was Saturday—the other boys were to proceed with the dogs to the "striking" ground and that I should make for the pine log at once and watch for the trick. Our plan was carried out and the secret discovered.

I took my position on a knoll about one hundred yards from the log, with it in plain view, and waited for developments. The "string" ground lay one mile west of my post, and I had just begun to feel like nodding, when I heard Forest, one of the truest and best foxhounds it has ever been my lot to know, strike the keynote, and pretty soon the game was up, and the whole pack of eighteen in full cry, came sweeping around the base of Anawaka Mountain. It was a clear, calm morning with a gentle breeze from the west, and every note was borne to my ravished ear. There were four or five dogs in the pack with a liberal supply of English deerhound blood in their veins, and they sounded the bass notes grandly. The very thick cover of brushwood gave the fox a decided advantage, and one turn around the mountain gave her the lead by at least a half mile. I was listening ahead, when on the top of the ridge across the creek, and directly in front of me, I saw the fox dash into view, clear the little strip of tableland at a few bounds, run across the creek on the old pine log, and make straight up the little knoll on which I sat as motionless as a statue, whirl directly back, after coming within ten feet of me, recross the creek on the same log, leap as far off the log up the creek as she could, and lie as flat as a fox could on bare ground.

I sat still to watch her panting sides and await developments. In a few seconds, on came the pack in full cry led by Alec, a fine young dog of my cousin's. They dashed across the creek, passed me in a twinkling, despite my frantic efforts to turn them back. Casting my eye back to see what had become of the game, I caught one glimpse of her scuddling back toward the mountain on the line she had just come over a few minutes before. Here was the trick. I knew her secret, and as soon as the over-eager hounds had satisfied themselves, that they had been duped by the wily brute, and had come back to strike the scent anew, I succeeded in explaining the trick to them, and in forty minutes after the dodge, around her breathless body, I explained it to the other boys.—J. C. W., in Forest and Stream.

THE COUNTRY OF STILTS.

A writer in Macmillan's Magazine, speaking of the quaint region known as the Landes, says: One need not ask why, since the collection of resin has been one of the chief industries of the Landes, wild creatures of all kinds have become much scarcer than formerly throughout this region, which is still very attractive to the adventurous sportsman, especially if he be likewise a naturalist. The resiniers have had a great deal to do with driving the wolf back to the Pyrenees, not so much by making war upon him as by worrying his nerves by the incessant tapping of the axes. A wolf has a delicate nervous system. A line of railway run through his district is quite sufficient to make him move elsewhere. The boar, a less nervous animal than the wolf, and a more formidable one when attacked, is frequently met in these forests He has nothing to fear from the resiniers, who, when they see him, have the prudence to let him go on his way, and they treat his spouse, when followed by her young, with even greater respect If the boar, on the other hand becomes imprudent and makes nightly raids on a maize field on the outskirts of a village, the villagers organize a hunt His taste for sweet maize stalks frequently costs him his life, but he sells it dearly ripping open dogs and sometimes men, fighting as long as he has strength to strike with his tusks Curiously enough the boar has a rival here in his congener, the domestic pig, which, having found the air of the forest and freedom sweeter than that of the sty or farmyard, became a self emancipated porker.

A few years ago these wild pigs—they are known as cochon sauvages—were so numerous in the neighborhood of Cazau and wrought such destruction upon the young pines that the government took energetic measures to exterminate them The wild pig of the Landes is of the same breed that supplies Paris with its much prized Bayonne hams. Formerly troops of wild horses roamed the Landes, just as wild horses and cattle roam the Carmargue—the desert of Providence and Languedoc. They have entirely disappeared. Roebucks, which were once plentiful, are getting scarce. Smaller quadrupeds, such as foxes and hares, are very numerous, and the wildcat is found in the forest. The Landes are peculiarly rich in ornithology. Birds which have almost, if not quite, disappeared from other parts of western Europe, such as bustard, the wild goose, and the wild swan, linger in their solitudes. Flamingoes are occasionally seen in districts where the marshes have not been drained, and there are wild pheasants about the banks of Leyre. There are tortoises in the sand, and the lakes contain a great variety of fresh water fish. Sportsmen to whom the pleasure of shooting something in old Europe that is really wild is heightened by natural obstacles, such as thickets that can only be penetrated by means of an axe, sand sloughs into which they may step unawares and not be heard of more, and forest flies capable of inflicting positive torture, would find in the Marensin, the district immediately south of Lake Cazau, an ideal hunting-ground. If the visitor takes out his shooting license at the mairie of commune which he chooses for the scene of his exploits, he may blaze away without fear of hindrance: but it is necessary that he should pay this local tribute, for the commune has the right to stop people from shooting within the bounds unless they are provided with one of its own licenses. The license costs 25 francs. Half of the money goes to the commune in which it is taken out, and the other half to the state.

DIAMONDS.

Diamonds are chiefly found in India and Brazil. They are also found in Malacca. Borneo, Algiers, Australia, Russia, and in some portions of our own country. The first diamonds that were known to the traders in precious stones in Europe, were brought from Vasapoor and Golconda. Th discovery of the mine in the latter place, i attributed to a poor shepherd, who, whil tending his flocks, stumbled upon what appeared to him a pretty pebble. This ston he gave in exchange for some rice to a ma as poor as himself. After passing throug several hands, it fell into those of a me chant, who knew its worth, and who, afte diligent search, succeeded in finding th mine. Having made excavations he foun a reddish earth, mixed with pebbles, an intersected by white and yellow veins, r sembling lime. The diamond mines c Brazil were discovered by a curious circumstance, in 1630. Some miners in searchin for gold found some curious pebbles, whic they carried home to their masters as cur osities. Not being considered of any value they were given to the children to pla with. An officer who had spent some year in the East Indies saw these pebbles, an sent a handful to a friend in Lisbon to b examined. They proved to be diamonds A few were collected and sent to Holland and were pronounced to be equal to thos of Golconda. The news soon reached Brazil and those who possessed any of the "pebbles," soon realized large sums of money. The Portuguese Government laid a claim upon all diamonds that might be found thereafter, and a search was made and mines discovered. The diamond is so rare and valuable, it is only carbon or charcoal in its purest state, and can be consumed by fire at a less heat than that required for melting silver. Nature's process for concentrating or crystalizing this substance remains a mystery. The numerous attempts to produce diamonds artificially, have not as yet turned out successfully. It is the hardest of all known substances, and the purest and most brilliant of all gems. It varies in color from red, blue, yellow, green, brown, gray, and even black. It is always found crystalized, and in its natural state, the surface is dull and uneven. The ancients were very familiar with the gem, though entirely unacquainted with the method of cutting or polishing it. The four large clasps of the monarch Charlemagne's mantle still preserved in Paris, consists of diamonds in their rough state.

A QUEER WAY TO GET FRESH WATER.

In the Persian Gulf is a place called Babrin, where men go a-fishing for drinking water. So, at least, a sailor who has been there told a writer in the Sun.

"I don't know who discovered the fact, but there are numberless springs of ice-cold water at the bottom of the gulf near the shore, where the water is about sixty feet deep. This must have been known when they first set up the town, of course, or it wouldn't have been started there. This water gets salt enough, though, before it gets from the bottom, and so they have to send down after it. When a man's wife calls him to go after a pail of water, and be quick about it, over in Babrin, he grabs a goat-skin bag, yells at the first neighbor he sees stretched out in the sand, and the two jump into a boat and row out a short distance. The man who is after the water wraps the goatskin around his left arm, with the mouth of the bag in his hand. Then he takes into his other hand a heavy stone. This stone is tied securely to the end of a long and strong line, for stones are valuable property there. Without them no one could go out and fetch a pail of water, and they are very scarce. With the stone firmly clutched in his hand the man dives into the water, and down he goes to the bottom. When he reaches the cool, fresh water gushing up from the sand he opens the mouth of his goatskin bag, drops the stone and floats upward in the strong current. The bag quickly fills and the mouth is closed again.

"When the man reaches the surface his companion lifts the bag into the boat, and the diver follows. The stone is then carefully drawn up, and the men go home.

"The water is cold and refreshing when it comes up from the depths of the sea, but it soon gets flat and warm. The more you drink of it the thirstier you get, but the natives can get along on a few swallows of it now and then. The requirements of the climate keep the divers at work in the submarine springs for all they are worth, and the shore is lined with their boats all day long. These springs are said to be the outlet of large natural aqueducts in a range of mountains more than 500 miles from the coast, but I guess they would have a hard time to prove that theory if they were called upon to do it."

THE FIGHTING INSTINCT IN MAN.

There is not the slightest certainty that any invention, however terrible, would put an end to war; while there is almost a certainty that if such an invention were perfected, it would grievously increase the miseries of mankind. Taken in the lump, men will face any means of destruction whatsoever, if also they possess it themselves. Give two men pistols, and they will fight across a handkerchief. They are not afraid of death, but only of death without a chance of victory. King Theodore of Abyssinia asked his courtiers, when the rocket sticks fell at his feet, if he could reasonably be expected to face things like those, and ultimately, in pure despair of defeating sci-

[illegible] Tyndall and his Alpine climbers. [illegible] death [illegible] fight each other as briskly as ever.—London Spectator.

CRINOLINE IN CLASSIC DAYS.

The Frankfurter Zeitung contains an interesting article on the origin and history of that revived monstrosity, the crinoline. Like many other devices which we are accustomed to regard as comparatively modern, the crinoline seems, in reality, to be exceedingly ancient. Hesiod, who wrote in the eighth century before Christ, must have observed something of the kind, for he advises young men not to be led astray by certain women of his day, who wore their clothes puffed out behind. For more than twenty centuries after Hesiod's time, however, the crinoline languished in obscurity; and it was not until after Queen Elizabeth had come to the throne of England that the farthingale became fashionable. The farthingale, or vertugade, which served to extend the skirts of the ladies of quality, who were Shakespeare's contemporaries, is described as having been made of hair and wadding. In the eighteenth century whalebone generally took the place of these cumbrous materials, but already iron or steel hoops were in use in England, and, covered with silk and cotton, steel hoops won their way to universal favor until, a few years ago, they were partially superseded by frills of highly starched muslin. If these improvers were actually worn by the Greek women of Hesiod's day, it is not impossible that they were also worn 200 years earlier, and that Helen, when she fled with Paris to Troy, wore some primitive kind of crinoline.

A SINGULAR HAVEN IN THE SEA.

It is said that a singular spot exists in the Gulf of Mexico, some ten miles to the southward and westward of Sabine Pass, a mile or so in diameter, upon the surface of the sea, which looks like all the rest of the Gulf during calm weather, but when the wind freshens to a gale and the waters about it become agitated, takes on a reddish color and becomes thick and muddy. The place has been called the "oil pond" that, while there may be a tremendous sea running all around the place within the circle of surf the water is comparatively quiet, and vessels which otherwise would be blown ashore or swamped, can there ride out the heaviest storms in safety, and have done so in hundreds of instances. The water is about twelve feet deep, and a pole can be pushed twenty-five or thirty feet through the soft and peculiar mud forming the bottom. This mud is different from anything on the coast, of a soapy character, and of remarkable cleansing properties, being often used to clean the decks of coasting vessels. The oil which renders the surface of "the pond" so smooth is supposed to come from the mud at the bottom, and many think there are deposits of petroleum not far from the surface, but of this I know nothing. Providence has thus provided a safe shelter for small craft out in the open sea, for the "oil pond" once reached during a gale is just as safe as a vessel lying under the lee of a lee wharf in Gaveston harbor.

THE INVENTION OF INK.

When ink was first introduced does not seem to have been decided, but given the paper and the pen, a colored medium which would show on a light surface was so obvious a want, and one so readily found, that there is no extraordinary credit due to the unknown inventor. It appears to be only of comparatively late years that black ink has been almost universal. Roman ink was red, purple and gold, and inks of blue, green, violet, and other shades were not uncommon. It is said that simple as is the composition of ink, "we possess none equal in beauty and color to that used by the ancients; the Saxon manuscripts written in England exceed in color anything of the kind." Modern ink makers will deny the superiority of the ancients; but who shall say whether words written in the ink manufactured to-day will stand as vividly centuries hence as those Saxon manuscripts have stood? It is difficult to see how the writing materials of the present day can be improved upon, for convenience at least, setting aside questions of lasting inks, which the generation that uses them cannot settle. Paper, rough and smooth, fluent inks of any color that the writer may believe suitable to his eyes, pens as fine as a needle or as blunt as a spade, are all to be bought in every street. The great lack of the age seems to be ideas at once more novel and sensible in the record of which these serviceable materials may be employed.—[London Standard.

CANINE ATTACHMENT FOR A HORSE.

A horse which once attracted great attention in the streets of New York fell lame and was sent to the country. There he formed the acquaintance of a dog—a cross between the St. Bernard and Newfoundland—and the two soon became very fond of each other. When the horse died straw was spread over his body until a pit could be dug. The dog seemed to be disconsolate. He ran off to a neighbor's house where his brother had a home, and an hour later the two dogs were seen to approach the carcass. They carefully removed the straw from the body, squatted down, one at the head and the other at the tail, and howled mournfully, then recovered the remains and crept silently away. The workmen who witnessed the scene were strangely moved by it, and they insist that it was one of the saddest and most touching of ceremonies. The dead was placed out of sight, but the dog often paid a visit to the grave. Some of the attachments formed in the animal world are not only strong, but marked by a high order of intelligence.—Turf, Field and Farm.

COLLEGE MEN IN LITERATURE.

Disputants about the value of college education have drawn up the following lists of eminent names and given them to the public to say which is the greater:

NOT COLLEGE GRADUATES.	COLLEGE GRADUATES.
Walt Whitman	Longfellow.
Whipple	Willis,
Trowbridge	Hale.
Field	Ticknor.
Parton	Motley.
Bayard Taylor	R. H. Dana, Jr.
Eggleston	Joseph Cook.
Harte	Emerson.
Howells	Hawthorne.
James.	Robert Grant.
Aldrich	Lowell.
Lathrop	Lodge.
Stockton	Holmes.
Piatt	Prescott.
Cable	Bancroft.
Crawford	Stimson.
Fawcett	Prentice.
Gilder	Alden.
Harris	McMaster.
Carleton	Warner.
Mark Twain	D. G. Mitchell.
Stoddard	Stedman.
Burroughs	John Fisk.

A NEW USE FOR TOADS.

The latest and most ingenious way of getting rid of roaches and water bugs we have heard of, says the Scientific American, is related of a citizen of Schenectady, whose kitchen was infested with them.

A servant, hearing that toads were an antidote, caught three ordinary hop toads, and put them in the kitchen. Not a roach or water bug, it is stated, can now be found in the house. The toads have become domesticated, never wander about the house, and are so cleanly and inoffensive that there is no objection to their presence.

Another use for toads is to employ them for insect destroyers in the garden. They are determined enemies of all kinds of snails and slugs, which it is well known can in a single night destroy a vast quantity of lettuce, carrots, asparagus, etc. Toads are also kept in vineyards, where they devour during the night, millions of insects that escape the pursuit of nocturnal birds, that might commit incalculable havoc on the buds and young shoots of the vine. In Paris toads are an article of merchandise. They are kept in tubs, and sold at the rate of two francs a dozen.

CURRENT LITERATURE.

Phonetics.

THE COMPLETE PHONETIC ALPHABET, ETC. Edwin Coombs. A. J. Graham, N. Y.

This book is one of the outgrowths of the spelling reform movement—a movement which is gaining strength very rapidly in these days. Those interested in the matter will find much of value in Mr. Coombs' work, and those who think it impossible to devise an alphabet to take the place of our present unscientific one will be surprised to discover the problem so nearly solved in this little book. In the words of a late reviewer, it may be said: "In this and in various other matters Mr. Coombs' book gives evidence of an amount of care and laborious attention to detail, which happily supplements the ripe scholarship and thorough familiarity with phonetic principles manifested in its pages. On the whole it is not too much to say that "The Complete Phonetic Alphabet" is a work which no one interested in the correct representation of English speech can afford to neglect reading."

Political History.

AMERICAN CONSTITUTIONS. THE RELATIONS OF THE THREE DEPARTMENTS AS ADJUSTED BY A CENTURY. By Horace Davis. Baltimore, N. Murray (Johns Hopkins' University), 1885.

This is one of the series of "Johns Hopkins' University Studies" now in course of preparation. In common with all the books in this series, the present one represents adequate scholarship and original thought. To one acquainted with the voluminous literature of the subject it may seem impossible to compress a just and fair treatise within the limits of a brochure of seventy pages; and yet so far from being trivial or a mere outline it is philosophical and comprehensive to a remarkable degree. Any attempt to characterize the work within the limits of a mere notice ould be worthless. At a later day a review will

Santitation.

A GUIDE TO SANITARY HOUSE INSPECTION, OR HINTS AND HELPS REGARDING THE CHOICE OF A HEALTHFUL HOUSE IN THE CITY OR COUNTRY. By W. P. Gerhardt, Sq. 16 mo. Cloth. Price, $1.25. New York: John Wyley & Sons, 1885.

This book is an attempt to outline a practical method of sanitary house inspection. The author abounds in good sense, and his little book is a vade mecum to those who regard health as one of the desiderata of housekeeping. Its suggestions are all practical and, without making any pretentious claims, it embodies the latest results of sanitary science, free from technicalities and "cranky" notions.

Evolution.

EVOLUTION IN HISTORY, LANGUAGE AND SCIENCE. Four addresses delivered at the London Crystal Palace School of Art, Science and Literature. Price 15 cents, post free. J. Fitzgerald, Publisher, 393 Pearl street, New York.

This interesting work forms a valuable addition to the series of popular scientific works known as the "Humboldt Library." The number of works published in that series now amounts to seventy, including many of the most celebrated writings of Huxley, Spencer, Tyndall, Darwin, and others.

Astronomy.

PUBLICATIONS OF THE WASHBURN OBSERVATORY. Vol. III. Madison: Wisconsin State Printers. 1885.

The University of Wisconsin has a reputation for physical studies not excelled in the West. In astronomy, especially, it has reached undisputed eminence through the valuable labors of Prof. Holden, as Director of the Washburn Observatory. The publication before us gives the results of observations of the 303 fundamental stars for the southern zones of the Astronomische Gesellschaft.

Other Publications.

The Inter-Oceanic Problem and its Scientific Solution. An address before the A. A. A. S. at Ann Arbor. Elmer L. Corthell, C. E. 1885.

Catalogue of Phaenogomous and Vascular Cryptogamous Plants of North America. By Dr. J. H. Oyster, Paola. Miami Rep. Print. 1885.

The Shells of Pettis County, Mo. By F. A. Sampson, Sedalia: F. H. Reynolds. 1885.

Voice of Singers. By Carl H. Von Klein, A. M., M. D. Columbus, O.: Ham & Adair. 1885.

Proceedings of the American Association for the Advancement of Science. XXXIII Meeting. Parts I and II. Salem. 1885.

Bulletin of the Illinois State Laboratory of Natural History. Vol. II. Art. III. Parisitic Fugi of Illinois. Part I by T. J. Burrell, Peoria. J. W. Franks & Sons. 1885.

Proceedings of the Boston Society of Natural History. Vol. XXIII, Part I: Boston. 1885.

Bulletin of the Sedalia Natural History Society. Sedalia. W. H. Reynolds. 1885.

Annual Report of the Kansas City Public Schools, 1884-5. Kansas City: P. H. Tiernan. 1885.

Some Titles From The Magazines.

"Atmospheric Electricity." P. H. Vanderweyde, M. D. The Electrician and Electrical Engineer for October.

"Abraham Lincoln in Illinois." E. B. Washburne. North American Review for October.

"America and the Vatican." W. W. Astor. Same.

"Actinic and Visal Focus in Photo-Micrography with High Powers." Jacob D. Cox. American Microscopical Journal for October.

"Ancient Canals on the South-west Coast of Florida." A. E. Douglas. The American Antiquarian and Oriental Journal for October.

"A Biography of the Halibut." C. Brown Goode. The American Naturalist for October.

"Campaign of 1861-2 in Kentucky, Unfolded through the Correspondence of its Leaders." (First Paper.) Gen. Wm. Farrar ("Baldy") Smith. Magazine of American History for October.

"Crystalline Rocks of Alabama." C. H. Hitchcock. The American Journal of Science for October.

"Cope's Tertiary Vertebrata." J. L. Wortman. Same.

"Clinical Aspect of some Disorders of the Gastro-intestinal tract of the Horse." Thos. B. Rogers, V. S. The Journal of Comparative Medicine and Surgery for October.

"Camping Tour to Yosemite Valley." I. L. Kephart, D. D. Microcosm for October.

"Chemistry of What we Eat." Henry A. Mott, Ph.D., etc. Same.

"Commensurability of Motions." Prof. Asaph Hall. For. Assoc. R. A. S. The Observatory (English) for October.

"Comparison (A) of British and Metric Measures for Engineering Purposes." Arthur Hamilton-Smythe B. A., etc. Van Nostrand's Engineering Magazine for October.

"Cylinder Condensation in Steam Engines. An Experimental Investigation." Chas. L. Gately and Alvin P. Kletzsch. The Journal of the Franklin Institute for October.

"Crumpling of the Earth's Crust." W. B. Taylor. American Journal of Science for October.

"Dogs (The) of Æsculapius." A. C. Merriam. The American Antequarian and Oriental Journal for October.

"Device for Testing Refractive Index." (Illust.) The American Monthly Microscopical Journal for October.

"Efficiency (The) and Duration of Incandescent Lamps." (Illust.) The Electrician and Electrical Engineer for October.

"Electrical Furnace and the Reduction of the Oxides of Boron, Silicon, Aluminum and other Metals by Carbon." E. H. and A. H. Cowles, and C. F. Mabery. American Journal of Science for October.

"Emmerich's So-Called 'Naples Cholera Bacteria.'" The Journal of Comparative Medicine and Surgery for October.

"Electric Conductivity of Metals and their Alloys." M. Lazare Weiler. Van Nostrand's Engineering Magazine for October.

"Early (The) Study of Plants." Eliza A. Youmans. Popular Science Monthly for October.

"Energy (The) of Life Evolution." Prof. E. D. Cope (Illust.) same.

"Fallacy (The) of 1787." A. W. Closon. Magazine of American History for October.

"Grant's Military Abilities." By a Confederate officer. Rev. H. W. Cleveland. Same.

"Geometrical Form of Volcanic Cones and the Elastic Limit of Lava." G. F. Becker. American Journal of Science for October.

"George Elliot's Private Life." E. P. Whipple. North American Review for October.

"How Plants Grow." H. W. S. Worsley-Benison, F. L. S. The Journal of Microscopy and Natural Science (English) for October.

"Human and Bovine Tuberculosis." J. M. Heard, M. R. C. V. S. The Journal of Comparative Medicine and Surgery for October.

"How to Quell Mobs." Fitz-John Porter. North American Review for October.

"Helen Hunt Jackson." Jeanne C. Car. The Woman's Magazine for October.

"Homes (The) of the Oneidas." Rev. W. M. Beauchamp. Magazine of American History for October.

"Inhuman Crimes in England." Cardinal Manning. North American Review for October.

"Interbond of the Seen and Unseen." Collected by the author of "Scientific Materialism." The Journal of Science (English) for October.

"Letters and Recollections of Grant." Admiral Ammen. North American Review for October.

"Mythic Dry Painting of the Navajos." W. Matthews. The American Naturalist for October.

"Madmen and Madness at Rome." The Journal of Science (English) for October.

"Microscopic (The) Structure of Iron and Steel." F. Lynwood Garrison. The Journal of the Franklin Institute for October.

"Microscope (The) and How to Use It." The Journal of Microscopy and Natural Science (English) for October.

"New (The) Star in the Great Nebula of Andromeda." E. W. Maunder, F. R. A. S. The Observatory (English) for October.

"On the Supposed Germinating Powers of Mummy-Wheat." Henry King-Parks. The Journal of Science (English) for October.

"Origin (The) of the Utes. A Navajo Myth." W. Matthews. The American Antiquarian and Oriental Journal for October.

"Observations Upon the Tertiary of Alabama." T. H. Aldrich. Journal of Science for October.

"Port Royal (The) Expedition, 1861. The First Union Victory of the Civil War." Brig.-Gen. Egbert L. Viele. Magazine of American History for October.

"Psendocyclosis (The) In Amœba." G. C. Wallach, M. D. American Monthly Microscopical Journal for October.

"Prehistoric Cities of Central America." (Illust.) L. P. Gratacap. The American Antiquarian and Oriental Journal for October.

"Pond Life II." W. E. Hoyle, M. A., etc. The Journal of Microscopy and Natural Science for October.

"Physical (The) Basis of Phenomena." H. H. Bates. Van Nostrand's Engineering Magazine for October.

"Relations (The) of Mind and Matter." (Continued.) Chas. Morris. The American Naturalist for October.

"Study (A) of Recent Earthquakes." M. A. Daubree. Popular Science Monthly for October.

"Second Law (The) of Thermo-Dynamics." J. Burkitt Webb. (Illust.) Van Nostraud's Engineering Magazine for October.

"Taensa Grammar and Dictionary" (The). D. G. Brinton, M. D. The American Antiquarian and Oriental Journal for October.

"Trading Rat. (The)" Mrs. E. E. W. Hatch. The Popular Science Monthly for October.

"Traces of Prehistoric Man on the Wabash." Jno. T. Campbell. The American Naturalist for October.

"Three New Portraits of Washington. Composite Photography." (Illust.) W. Curtis Taylor. The Journal of Franklin Institute for October.

"Water Supply (The) of Ancient Roman Cities." Prof. W. H. Corfield. Van Nostrand's Engineering Magazine for October.

"White Ant (The) A Theory." Prof. Henry Drummond. (Illust.) The popular Science Monthly for October.

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NOVEMBER, 1885.

WARREN WATSON, - EDITOR.

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SAM'L S. LAWS, President.

the common property of all primitive races, it is also true that the Israelites alone preserved both the faith and the written statement of its origin, showing precisely what it was, and the process of the only development of it; and inasmuch as a great philosopher writes concerning 'the supernatural' as if he might be profoundly ignorant of the whole matter, it may be well to reproduce the facts presented by the original record, to demonstrate that these ideas of the supernatural did not "evolve out of ideas concerning the natural" but was revealed by God.

Some thirty-five centuries before the agnostics became so erudite and reputable as they now appear to be, Moses, the Monotheist, writing to and for his people who were all Unitarians, designated the one God in whom he and they beleived, by the name *Elohim*, which is the dual number of a Hebrew noun, and means two or a double God. He also represents the one God as applying to himself the pronouns *us* and *our*. "Let us make man in our image and our likeness." He also says that the two Gods, or the one dual God (*Elohim*) "created man in his own image; in the image of God, (the dual God) created he him, male and female created he them." The same solemn and mysterious declaration is afterward most emphatically reiterated. "This is the book of the generations of Adam. In the day that God created man, in the likeness of God made he him; male and female created he them; and blessed them, and called their name Adam, in the day when they were created."

Mr. Spencer is severe against anthropomorphism, but he must admit that Moses does not carry this natural fault so far as to declare that the "image and likeness" in which the human was created, subsisted in the form or bodily parts, or in the holiness or intelligence of man; but he expressly and repeatedly affirms that God created man in his own image *in this respect* that he created man, (the human), "male and female."

It is therefore too plain for argument, either that Moses believed that there were two Gods, (one male and one female) in whose image man was created, or else that the one God in whom Moses believed, was a Dual Being, self-existent, combining in one person both poles of spiritual sexhood, which faith we have seen to have been the common theism of all primitive races, and utterly antagonistic to the idea of evolution.

Moreover, Moses expressly informs us that up to a short time before the Exodus out of Egypt, the Israelites conceived God to be a Great Spirit, having about the same idea of Deity, that the red-men of America possessed, when the Europeans discovered this continent, and that the Dual God then revealed himself to Moses by the other essence of his dual nature, and assured him that he was not only God Almighty, *Elohim*, the Infinite Wisdom and Power, but that he was also Jehovah, the Infinite Life and Love, and that this revelation was made in order to satisfy the doubting and complaining leader of the divine love for the chosen people. "I am Jehovah, and I appeared unto Abraham, and unto Isaac, and unto Jacob, as God Almighty, but by my name Jehovah, I was not known unto them." The account is given in full at Exodus V. and VI., and is curious and instructive, especially on the point that God was, according to Moses, one dual Spirit.

After God had created man (the human), he brought before man "every beast of the field, and every fowl of the air, to see what he would call them," in order that man might see that there was no creature that *'omoousios*, consubstantial help-meet to man. Then God said; "It is not good that the man should be alone," (or one). Then he made a rib of the human into a woman, and distributed the dual human nature's female element into another form or person consubstantial *'omoousios*, to the first form, and upon this identity of substance existing in different forms and persons was founded the institution of marriage. [Gen. 11, 23, 24.]

"Woman" and "Eve" were names given by the male to his help-meet; the very divine name was "Adam," "CALLED THEIR NAME ADAM, in the day when they were created."

The Talmudist say that human was created man-woman. Plato in his Symposium undertakes to account for amatory passion by which one man and one woman cleave unto each other of choice, by the declaration that the human was originally created androgynous, and that Zeus afterwards distributed the sexes into different forms of persons. Jesus Christ said that "Ye do err not knowing the scriptures" (*i. e.* of Moses) "for in heaven they neither marry nor are given in marriage; but are as the angels of God," meaning surely that our idea of sex is a physical differentiation, not essential to the human, except for the propagation of the species by natural generation in accordance with the Divine command, and that when we "shuffle off this mortal coil," that physical distinction ceases. And finally the physiologist
inform us that up to a late period i
gestation, the fœtal human has n
sex.

The four Gospels tell us that Chris
was 'begotten' of God, 'conceive
of the Holy Ghost, "in the begi
ning," before the creation; and t
Fifth Gospel ('the Gospel of the H
brews,' regarded by many critics
the original and authentic accoun
boldly and unreservedly states th
the Holy Ghost (Jehovah) was t
mother of Christ, ages before he w
born of Mary; and the Christi
church so taught and believed un
Constantine subverted it, and esta
lished Ecclesiasticism upon the rui
of Christianity and Paganism, in ord
that he and other tyrants might ru
over their fellow men "contrary
the scriptures."

Such was the Theism of Moses a

of the Prophets, and of the ante-Nicine church, taught from the very beginning; such was the Theism of all the primitive races before idolatry was known to mankind, a Theism certainly not less than forty centuries old; and an agnostic who can believe that "the ghost theory exhibits those steps quite clearly," by which these ideas concerning the supernatural evolve out of ideas concerning the natural," the first step being belief "in the fact that the other-self, supposed to wander in dreams, is believed to have actually done and seen whatever was dreamed," simply supplies us with a new illustration of the fact that the grossest intellectual errors are apt to follow the determination to apply physical laws to moral questions.

It is therefore simply to belie the facts if one say that "these ideas of the supernatural evolve out of ideas concerning the natural;" or if any one say that primitive faith was less perfect or less philosophical than it has since become "by the intellectual development which causes dissatisfaction with the crude interpretations previously accepted;" for the Theism of Moses is perfecter than that of Athanasius, and the theocracy of the law-givers was enlarged by the Prophets and perfected in Christ.

Mr. Spencer and the Agnostics are accustomed to speak condescendingly of the "Elohistic" and "Jehovistic" characteristics observable in the Pentateuch—is it true, then that these erudite gentlemen were ignorant of the *fact* that Moses in the fifth and fourth chapters of Exodus expressly states that prior to his own day the Divine being had appeared only as Elohim, but that He revealed himself to Moses as also Jehovah? "And Elohim spake unto Moses, and said unto him, I *am* Jehovah; and I appeared unto Abraham, and unto Isaac, and unto Jacob as Elohim, but by my name of Jehovah was I not known unto them".—Ex. vi. 2:3.

Not only does this article speak of comparatively modern nations among whom the primitive faith had long been overlaid by polytheism and idolatry, as if their "crude interpretations" were the original form of religion; but with a suavity that argues either dense and hopeless ignorance, or else finished and heartless duplicity, attributes to that true religion which God revealed to primitive man, and which was gradually developing from the days of Abraham all the monstrosities and abominations moral and intellectual which Constantine founded upon the ruins of the subverted Christianity.

"The cruelty of a Fejian god who, represented as devouring the souls of the dead, may be supposed to inflict torture during the process, is small compared with the cruelty of a god who condemns men to tortures that are eternal;" "the visiting on Adam's descendants through hundreds of generations dreadful penalties for a small transgression which they did not commit; the damning of all men who do not avail themselves of an

[illegible]

[illegible]

[illegible]

[illegible] upon Moses, and upon the Prophets, and upon John the Baptist, Matthew, Mark, Luke and John, and also upon Jesus Christ, when he ascribes these dogmas, or any one of them, to the persons named, or any one of them? Moses never wrote one single sentence concerning "immortality," or "the life to come," or "a future state of rewards and punishments." No prophet makes the slightest reference to any such dogmas. John the Baptist preached all through Judea, and utterly failed to enunciate any such dogmas, and Jesus Christ Himself prescribed for His own disciples a form of prayer (the Paternoster) which contains not the least intimation of any such things as "immortality," "the life to come," or a "future state of rewards and punishments."

These dogmas were no part of the Revealed Religion, for "the Kingdo
of Heaven" from the days of Ada
down was the temporal governme
of God exercised over the chos
people in this world and was not
"spiritual" religion, and had no r
ference to the world to come. T
The only "salvation" contemplat
in it was salvation from crime, hatre
violence, oppression, pauperism,
this world. It was the utter neg
ation of human authority and the a
sertion of God's sole right to rul
and if a man will only dismiss a
ecclesiastical "interpretations" fro
his mind, and carefully examine th
Mosaic statutes concerning "Th
Lord's Release," "The Year of Jul
lee," "slavery," "usury," and p
vate property; he cannot fail to rea
the conclusion that no state in Chri
tendom to-day possesses a social a
political code so wisely devised to
cure the common good, the pub
welfare, liberty, equality, and frat
nity for all men, as was the code
Moses; nor can he fail to see that t
prophecies foretold that under Chr
these statutes were to be administer
for all men, nor can he fail to disc
er that the very system of which t
Israelitish kingdom was the antety
actually existed for about three c
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He would beyond doubt lea
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set forth the one indisputable f
that the Religion was, from the g

esis of it, a perfect system morally, socially and politically, and only became imperfect human faithlessness and consequent degradation of the religious idea, is false in fact. He would percieve that those who speak of Jesus Christ as a "victim," and of visiting on Adam's descendants dreadful penalities for a small transgression which they did not commit," and of "damning all men who do not avail themselves of an alleged mode of obtaining forgiveness," *libel* the old Testament and the Gospel, and the Acts—and Moses and the Prophets, and Christ, for none of them ever taught or believed, any such things as these; they belong to Constantinism and not to Judaism, or to Christianity. He would perhaps discover it to be the direct, simple statement of a matter of fact to declare that mankind had in some way (which Moses symbolizes by his story of the eating of an apple in violation of the Divine command) fallen into a condition of conscious alienation from God, and all men were under conviction of sin, and that human endeavors to escape from this condition had filled the world with false religions from the dawn of time, and that the Son of God offered himself as the example of a mode of life by which man might become consciously at peace with God, by faith in him—a Divine "Enabling Act" suited to human incapacity. He might perhaps perceive that the Revealed Religion was divinely ordained to train men up to be fit for freedom in order that they might be holy; and *that apart from the Ceremonial Law*, the statutes ordained for the social and political regeneration of the Jews first, and of the Gentiles afterwards, were infinitely more wisely *adapted* to the accomplishment of that purpose than human legislation has ever been since to-wit; that the Laws of Moses were, and are unto this day, the best laws ever framed for any people; for while Christendom has borrowed from them, it has not improved them. He might finally feel a profound conviction that it is a sacred duty which every man of Mr. Spencer's ability, owed to his burdened fellow-man, to free himself from the strong and popular delusion that Constatine's ecclesiastical system which sanctifies the blasphemies of human authority, war, slavery, usury, and mammon worship, is the same Revealed Religion which from the days of Adam to those of the Nicene Council utterly repudiated all these infamies, and offered to mankind the only social and political system (based upon Faith)whereby it ever was, or ever will be, possible to banish crime, hatred, violence, pauperism and selfishness out of human life, and so regenerate the world; making, true Liberty and Religion possible for all men; and would see for himself that the Revealed Religion was never designed for anything but the temporal salvation of mankind, except in so far as it may be true that the spirit continues its own development in the life to come, we know not under what conditions, nor to what end.

He would find that this system which was "Revealed," not "evolved," was imbedded in the law of Moses, and that the assertion of God's sole right to rule, the statutes against slavery and against usury, the statutes of the Lord, Release and the Jubilee (Lev. XXV.) were typical of it; that it was enlarged upon, and its full establishment foretold by the Prophets; that it was established by Jesus Christ, and continued for three centuries, and was rapidly regenerating the world when Constantine subverted it, and that the system of which the law was the type, the Prophecies the interpretation, and Primitive Christianity the fulfillment, was Faith plus Communism, the only True Democracy.

EVOLUTION IN THE ORCHARDS.

I have my family around me in my cottage, and we are a number of rather decided individualities, each one with peculiar features and tastes; but in my orchard there is a family of about the same age that is decidedly more positive and peculiar in its idiosyncrasies. The great rose family includes not only the rose and the briars, but the apples and the pears, and plums and cherries. Of these the apples and pears are generally associated in the orchard and are most closly related. Yet they must have come off from the parent stock at very different periods. I mean that the old rose ancestor had children that were apple-like and apple progenitors before it had pear-like children that were progenitors of the pear. The apple has certainly a much longer history than the pear, and has been much longer undergoing a civilizing process. You can see this in the fact that the pear reverts to thorn-producing very uniformly, while an apple is rarely found that has a trace of this primitive characteristic of the whole family. For at the outset not only rose-bushes were thorny, and blackberries and raspberries thorny, but apples, pears and all the rest of the cousins. The reason that some of them are not thorny to-day is that they have for a longer time been in possession of man, and not needing thorns have learned to leave them off. It is decidedly for the advantage of any bush or tree that has become an associate of man not to be thorny; for man is certain to reject the more thorny for the less thorny. While not objectionable to other fruit-eaters, thorns are very much in man's way. The result will be that in time such a characteristic will be eliminated from all fruits that are cultivated.

The raspberry has already made some moves in that direction till we have some excellent varieties that are nearly or quite thornless. If a new variety shows itself among blackberries that has left off its terrible barbs it will be sure of survival as one of the fittest things in the garden. So we say the pear has not been with man as long as the apple has, because it has not learned to adapt itself so well to man's requirements.

This relative age of the pear and apple under civilization is also determined by the fragments found in the refuse heaps of the old Stone Age and the Swiss Lake dwellers. In their "kitchen middens" not more than a handful of fragments of pears have been found, while apples are discovered in abundance. As an ancient fruit it was a very small and almost worthless affair, and occupied but a limited area. Pliny and the poet Horace both refer to the pear, and Pliny says very explicitly that it could not be eaten unless cooked. So that historically the pear has a meager record, while the apple has a name in almost all languages, and is referred to by many writers as a notable fruit.

As true dessert fruits the pears date back only to the middle of the last century. The apple, on the contrary, is one of the oldest of eatable garden productions, dating back many hundreds of years, not only in Europe, but in a large part of Asia. It seems to have been brought into Europe by the earlier Aryans in a somewhat improved or selected state. At present we find in our orchards as a result of more recent selection a large number of special branches of the stock, varieties they cannot be called, as each group contains innumerable varieties, and those not species became established long before any pear was worthy of classification as a dessert fruit. The pippin got its blood so thoroughly fixed 200 years ago that its seedlings are distinguishable to-day all over the world. That is, in an orchard of seedlings, or in a wild thicket of apples. a good horticulturist is likely to find apples easily distinguished as descendants of the pippin line. They may be quite out of direct descent, and crossbred to many degrees, yet by flavor, color, texture, shape, core, seeds, sutures, stem or otherwise. it is easy to determine the ancestry to be remotely pippin. Such family groups of pears we have, but very much less firmly established. When a variety of any fruit gets to be so positively traceable in descent we may be sure that it has been for a long while undergoing selective influences. Nothing is so hard to settle down to fixed idiosyncrasies as a sub-species. Break up a type and the tendency for a long while is toward infinite variation. Instability governs form or color or quality, or all these and other characteristics. I have over 200 cross-bred varieties of beans, which I have produced within four years. The trouble now is to fix the characteristics of any one of them, and stop the further propensity to crossing. The apple, however, has for a long while had what may be called horticultural species, one of which I have referred to as the pippin; others are the belleflеur and gilliflеur.

The apple has been so long man's companion and under the control of man that it has not only lost all recollection about thorns, but has been in many other ways civilized and refined. Now our word culture, as applied to people of a long line of educated generations, is a word borrowed from tree-growing and plant-growing. A tree is cultivated, that is, educated, by man's wisdom and skill. As a matter of fact, nature never quite forgets what she has once done. She likes to rehearse, just as we like to tell what we did when children. The frog never gets to be a frog until he has gone over his ancestral history as a tadpole. So the pear, if you sow the seed of a Sheldon, runs back to its ways of doing 10,000 years ago; only it may be that one seed in a hundred will tell the other story of progress. But the apple has very much less of this propensity to far backward looking. It is quite settled down to be content with civilization, and has even forgotten a good deal of what it once knew.

Now, we know that the great rose family, including pear, apple, quince, plum, almond, peach, apricot, rose, strawberry and blackberry, is peculiar in this, that it has developed a power to bribe insects and animals to do it some sort of service; for that really is what the strawberry and the apple and the other edible seeds are. They are temptations to induce the birds to eat them and so carry the seed about and sow them, and in that way enable them to spread and multiply. This bribing family never appeared on the earth until fruit-eating birds appeared—that is, the fruit-eating birds and the fruits for them to eat were created by evolution together. But, while it was a part of the business of these trees to get their fruits eaten, it was equally a part of their business not to get eaten themselves, therefore thorns were quite as necessary as nice apples and berries. The seeds evolved a power to swell out into receptacles of a pulp and juice agreeable to the birds, but they protected themselves against the browsing of animals as vigorously as they welcomed their feathered friends. The raspberry puffed out the whole ovary; the strawberry the seeds and ovary both. There was but one exception in the family to the thorn-producing. The strawberry or potentillas, nestling close to the ground, got a habit of running away from enemies and hiding, and so did not need to barb the noses of intruders.

And this went on after a simple sort for thousands of years. Strawberries, however, were but little more than dry seeds; and apples were only haws and other very insignificant things. But by and by man appeared on the scene, and though he at first had but little more taste than the other animals, he had just one thing more, a power to educate his taste. And as he educated his taste he took the rose family out of the hands of nature and began to educate that too; just as he began to educate the wild beasts and make them tame ones. It was slow work, both with himself and with his pupils. All the steps we can't trace. But here we both are after 100,000 or 200,000 years and the result is quite satisfactory.

The bribe that the pear and apple offered at first to the birds and animals is largely withdrawn from them and offered now to man. They don't care whether animals like them or not, if they can only gratify our palates. I mean they don't much care, the really civilized members of the family do not. The apple, especially, has got quite used to catering for our markets. And the pear will after awhile get to be of the same mind. Of course there are a good many barbarous branches of the family, as there are savage tribes of men; and they will just be grafted, for it won't pay to work at them in the slower way of natural selection. Still once in a while the survival of the fittest gives us a Seckel pear right out of a wild tribe like Red Jacket or Scenondo among aborigines. So the apples, pears and berries of to-day are such as suit the palates of men and not of the birds.

But that is not all; they do not any longer have to protect themselves against being eaten up, and so they have stopped growing thorns. The apple tree has found out that it is safe enough without growing thorns. It is men's interest to protect it. And the pear after a few hundred years more, or may be less, will find out the same fact. A good many have already settled down to a thornless way of growing. Gradually everything takes into consideration man's habits and tastes and fits to them.

Will the roses shed their thorns also? Some of them, those longest in man's company, have already done so; but the tendency in some species or varieties to revert to thorns in seedlings is yet very marked. This will all be forgotten in time. And by and by our gardens will surely contain only varieties of berries that any lady can pick without being troubled with a survival of barbarous characteristics. The thorns will all be gone.

Now, I want you to observe the tendency of evolution in another way. It works in the same way with apples and pears and roses and men. I mean the tendency to individualize or concentrate its form, not on number, but on quality. This innovation came in when man was created, but it was passed over slowly to everything else that comes into man's closer association. Here is a wild-thorn apple growing beside a Northern Spy. In May they are equally profuse in bloom, because blossoms are for the eyes of insects as well as men; and the insects must be attracted to do an enormous amount of fertilizing, and take their pay in beauty and honey. But in June the flowers are all off. The Northern Spy forgets about the birds and thinks only of man. So it throws away nine blossoms, and with the remaining one it goes to work at producing a great apple that shall be picked in October by man, and eaten by him, and so please him that he will protect that tree and graft it everywhere. On the other hand the wild apple does nothing of this sort. It does not know man nor consider him; it is a wild, untamed nature, and still thinks only of the birds. So for every blossom it produces a fruit, but every fruit is a little hard bitter affair that no man can eat. Here you see nature is making in the Spy the high-bred, costly individual, and this is what has lately been going on in our orchards. Just as in modern society the aim is to bring out superb men, instead of masses of human beings. But what of the wild haw or thorn apple? It has fallen under culture in another direction. Man does not care to educate its fruits, but he has found that he can educate its blossoms. Some haws and other thorns were found to vary slightly in color and size of flowers, and as man lives not only to eat but to see fine things, he has selected these to be preserved, and so we have now scarlet flowering and double flowering crabs and haws.

But all this while man himself has been a creature of evolution quite as much as the things he cultivates. His senses, and especially his taste has grown to be a very different affair from what it used to be. He will not eat now what a few generations ago was eaten with satisfaction It would be hard to bribe a party o horticulturists to eat a Bon Critic pear, that fifty years ago was readil eaten by their fathers; or a bell pear, whose name indicates the opinion held about it. It is not unlikel that fifty years from now, that princ of good pears, the Sheldon, will b quite behind the cultured palates o our children. There are doubtles bad flavors in the Seckel and Anjo that you and I cannot discover, bu which will some day be fully apparent to daintier tastes. Evolution is purpose in nature that aims at bette things all the time, and so it make men as well as men's foods to improve.

Daintier birds as well as daintie men are the result, and always wil be the result. And then daintie fruits will be needed, and whateve is needed will be sure to be supplied And so it will go on, better men demanding better foods; better fruit demanding better men. The possibilities hidden in this grand ros family are almost as great as thos hidden in man himself. The quince which is also one of the same family has a hint of some wonderful thing that may not be brought out in lon ages. The berries are marching o very rapidly. We shall have strawberries, in time, as large as eggs and richer in flavor, than we coul now appreciate if we had them. Wit daintier men come daintier bird Robins are one of the more fastid ous sorts that have grown up as a r sult of man's culture. He will on a pinch, eat a great many poor fruits, but he knows a good one when he can get it. He lives with us, not because he admires us, and our cats, and wicked boys, and ornithologists, and specimen hunters, but because he has a taste educated to the fruits he can only find in our vicinity. He is spoiled for wild life. Indeed the robin red-breast is purely a product of civilization, appearing only with man. And the cat-bird is being spoiled as fast as possible, for anything short of the finest cultivated raspberries and green peas. And we have several more birds on the same road. They can eat the old bitter berries when driven by hunger, but they have learned to know good fruits when they find them. The same is true, unfortunately, of some pestiferous insects.

So you see our apples and pears are members of a very curious family, and have a very interesting history, and a great future ahead of them. The two families that move along together, the very highest representatives of the culture of the vegetable kingdom and of the animal kingdom, are the rose family and the human family. Indeed, neither one could have become quite what it is but for the other. And if to-day the rose family should be obliterated I think it would go very hard with us to keep up our civilization.

THE KHETSHUA (Qquetchua) LANGUAGE.*

This publication of the renowned Swiss scientist and traveler, is summing up the results of a whole lifetime's assiduous studies upon *one* subject. To Tschudi's initiative and close observation, we are indebted for much of our scientific knowledge of the Peruvian people, language and antiquities, and for the last forty years his numerous publications on Peru are reckoned among the most thorough accounts on that distant and, in many respects, mysterious country. The main part of the volume before us is devoted to a free discussion of the grammatic peculiarities of Khetshua and its sister-dialects. Modern views and methods of treating grammatic subjects are adopted by the author; scientific precision is not coupled here with that dryness of style, which clings to the majority of books on grammar, and to linguistic treatises, and discourages so many readers from attacking the subject. Frequent comparisons with languages of other South American countries bestow peculiar attractiveness upon the subjects under treatment. The chapter on syntax is but short, for Khetshua, as well as many other synthetic languages, have syntatic rules simple in the extreme; valuable additions to the volume are three long Khetshua texts with commentaries and an excursus upon the Chinchay-suyu dialect. The phonetics of the language are discussed at length, and the polemics of the author against other grammarians, especially Pacheco-Zegarro, fill many pages. The difficulty of the subject, which requires many other explanations besides, and the general importance of phonetics for the grammar of any language, sufficiently excuse these polemics. Pp. 92 *sqq.* embody a full bibliography of authors on the Peruvian dialects. The preface contains many statements of great interest and information of a startling and novel character. The historian, Garcilaso de la Vega, mentions a language spoken only by the Inca (members of the dynasty); it was considered divine, and the people were prohibited from acquiring it. But the eleven words which he mentions, and supposes to have been a part of the "Inca vocabulary," are either pure Khetshua terms or reducible to Khetshua radicals, and hence we fully approve Tschudi's opinion when he rejects the existence of the secret language altogether. What gave origin to Garcilaso's statement was probably the admixture of a few archaic words in the language used at court. The common language of Peru was first called *Khetshua* by the monk Domingo de S. Thomas, in his Dictionary of 1560, whereas the chroniclers before him called it, *lengua general del Peru; lengua cortesana; lengua del Cuzco; lengua del Inca.* The Khetshua *tribe* was one of many other tribes speaking that language, and during this century dwelt in the province called Andahuaylas; but why S. Thomas called the language by the name of *that* tribe, by which it is still named, is an unsolved problem, and the signification of the name is unknown.

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*Von Tschudi, J. J., Organismus der Kletshua-Sprache. Leipzig, F. A. Brockhaus, 1884. 8 vo. XVI. and 534 pages.

The linguistic families of South America, are discussed pp. 26-30; 82 199, and a frank avowal is made of the enormous difficulty experienced in classifying them scientifically. The dialect of the Peruvian family, that is the sister-dialect of Khetshua, are sketched in detail (pp. 66-82), and the dialect commonly called Aimara relegated to another family of languages, the Kol'a. Ludovico Bertonio, an Italian Jesuit, wrote a grammar and a dictionary of that sonorous language, published respectively in 1603 and in 1612. This language is nothing else but the Lupaka dialect of the Kol'a stock, though introduced under the misnomer Aimara. Aimara was, says the chronicler Ramos, the name of one of the tribes, from which individuals were brought by the Inca Kapak Tupanki, to the shores of Lake Titicaca, and settled there as colonists; they spake a Khetshua dialect. Tschudi refutes every genealogic connection between Aimara, which is still spoken in Peru, and the Lupaka of Bertonio, although he states that the latter was largely influenced by Khetshua, especially in its lexical elements.

Thousands of years before the Inca dynasty ruled the country, Khetshua was spoken in the same valleys where we find it spoken now; but which tribe or nation spoke it first? Contrary to the common opinion, that the Cuzco and Puno districts are the cradle of it, Von Tschudi's researches led him to assume, that the original Khetshua-speaking people came from the North, spread out for a while in the countries extending between the Andes and the Upper Amazon River, then slowly advanced toward the Huaraz, and finally reached the "lagune of Titikaka." where warlike tribes checked their futher advance. The dialects of Quito and Chinchaya, contain more archaic forms than those of the South, and hence the language probably originated in the North.

"Red men," the vulgar designation adopted for the Indians, is a mistranslation of the term *hombres colorados* of the earlier Spanish chroniclers. This term has to be rendered by *men of color*, *men showing color*, and not by *red men* or *redskins*, for the natural color of the Americans is rather brown than red or anything else. Von Tschudi states that in America the natives of countries showing the lowest medium temperature possess the darkest, of highest medium temperatures, the lightest complexions, *though there are exceptions to this law*, (a large number of exceptions, we think). The fact that every family of Indian tribes or languages possesses a distinct and different name for the Indian corn or *maize* leads him to the conclusion that this plant probably did not come from one original species, or travel from one original district to all the innumerable tribes of America. Maize is indigenous in America, but is nowhere found in its wild state at the present time, (p. 47, note). The difference in the aboriginal terms for maize does not prove much, we think; for when it was first imported into Europe, it came there under the only name of *màize*, (mahiz); now almost every European language has a different term for it. The momentous problem of the unity or plurality of creation-centres for *man* is mentioned by our author with the remark, that with the scientific facts now at our disposal we can not solve it, and that Darwinism, with its "entire apparatus of truth mixed with poetry" is just as powerless in that respect, although "in its well-known modesty" it has not been slow in giving its own solution.*

There is no uniform type for native skulls in America or elsewhere; complexion proves nothing for the original racial condition of a tribe, nor does community of customs, habits or religion (pp. 8-10). Whether we subscribe to all the above opinions of Von Tschudi or not, his book will have one good effect; to set us thinking about anthropological questions in general and South American ethnography and linguistics in particular.

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*J. J. Von Tschudi evidently confounds Darwin with his followers, the evolutionists. The last mentioned blemish may be inherent to a few of the latter, but Darwin himself was a model of modesty.

PROGRESS IN ELECTRIC RAILWAYS.

The latest periodicals are full of interesting descriptions and drawings of new appliances of electro-motive force to car locomotion. The following is a statement of the various attempts in this direction at different localities. The descriptions are condensed but retain the salient points in each system.

NEW YORK CITY.

One of the results of the meeting of representatives of the various electric railways in New York, last fall, has been the inauguration of the Daft System on Ninth Avenue, commencing at 14th street, in that city. A third rail has been laid on this line which is insulated by a patent device to prevent water from making connections from rail to sleeper in unfavorable weather. The steam-power consists of a large Wm. Wright engine with necessary accessories. Three fifty-horse Daft dynamos, of which two are in position, will generate the current, which is carried through the streets, upon poles, to the rails. The motor used in this experiment will be fourteen feet six inches long and six feet nine inches wide and will weigh nine tons. [illegible] inciples of its applications may be briefly described as follows: The motor is mounted upon a truck, directly over the driving wheels, so that it turns on an axis at one end and may be lowered or raised at the other by a screw. The power is transmitted directly from the motor to the wheels by a grooved friction-gearing which consists simply of two parts, one keyed to the armature shaft, the other to the drive-wheel shaft. The pressure of the friction gearing is regulated by the screw which raises and lowers one end of the motor; this screw being useful also to raise the motor entirely away from its friction bearings. The supports of the motor are heavily cushioned with rubber as well as the trucks themselves. The connection with the middle rail, the conductor in this system, is by means of a heavy bronze wheel, fourteen inches in diameter, which may be raised or lowered at will. The contrivance for controlling the motor is placed at the outer end of the car, and consists of a sliding-contact device which raises or lowers the resistance in the field-magnet circuit. Of course this method diminishes, or increases, the speed of the motor by diminishing or increasing the amount of current.

There being also a cut-out in circuit, it is possible to run fast or slow, or to stop the car by this device alone, while it also possible to stop the car by the friction wheel. There is also an automatic signal device which warns the engineer of trouble on the road. The reversing gear is of the simplest character—four contact brushes which can be applied alternately in pairs. Ordinary hand-brakes will be used at present but some form of air or electricical apparatus will be used hereafter.

The Edison and Field companies have combined and are preparing to test their system on the Second Avenue line. Their steam-power is a 250 horse Whitehall & Smith engine, with accessories. On account of the high electro-motive force used (600 volts) the central rail (which conducts the current) must be carefully insulated. This is accomplished by supporting it on glass shoes protected by rubber strips from jars and vibrations. Since the commencement of their experiments these companies have changed their devices several times; but the latest is as follows: Each car is provided with a motor, thus being independent; and it is thought that by this means the strain from the traction required to move a heavy train will be evenly distributed. The motor is placed beneath the car floor on an extension of the truck. This removes the center of gravity of the car to a point near the driving-wheels, which are, of course, nearest the motor, and these must be depended upon for traction. The motor used is a compound-wound Siemans which gives 600 revolutions per minute by the use of an electro-motive force of 600 volts. The power is transmitted from the armature of the motor to a pulley, by means of a Weston friction-clutch, which is governed by an ordinary brake-wheel. From the pulley the power is taken to the driving wheels by a heavy leather belt. The tension of the belt may be varied by moving the motor back and forth or by means of an "idler," which also serves to give more bearing surface for the belt. Contact with the conductor is made by means of sliding brushes which are mounted on the ends of bars that keep them suspended when another road is crossed. The brushes are so arranged that they can turn, on reversing, and thus always drag: this gives a uniform current when passing joints etc. An extra pair of brushes, as in the Daft system, is used for reversing. Speed will be controlled by the friction brake, the motor running at a constant speed. The Eames vacuum brake will be used.

PHILADELPHIA.

Permission has been given the American Electric Railway Company to lay a conduit and experimental line on Ridge Avenue from the depot at Dauphin Street to Laurel Hill Cemetry. The work will begin in a few weeks. The company, says the *Electrical Review*, at first intended to lay its experimental tracks in order to demonstrate the applicability of the electric motive power in Fairmount Park, and obtained authority to this effect from the Commissioners, but subsequently the decision was made to lay down a conduit and establish a plant in connection with an existing railway as a better means of demonstration to the public and those interested in electric railways.

Ridge avenue was chosen because of the peculiar grades, and in order to show the superiority of the new motor over horse-power in surmounting them in all weather.

The Electric Company will next week start work on its shop and engine-house. One car, provided with a motor, will be run at first, and this will not interfere with the trips of the regular horse-cars. The car will be one of the ordinary cars altered for the purpose, and will carry as many passengers as usual, the idea being to give the two motive powers a fair test, the claim being that the electrical is greatly the cheaper. The conduit will be laid so as to avoid interference with the travel of the horses, and the tracks will not be disturbed.

In shape the conduit will somewhat resemble those laid by the Traction Company, but will be of heavy timber, instead of iron, below ground. It will be braced inside with iron knees and provided with drainage facilities. Running along beneath the top will be the compound conductor of copper and iron,
half circular in shape, well insulate
and protected from damage from ou
side influences. On the top of th
conduit forming each side of the slo
which will have a half inch openin
will be iron plates about five inch
in diameter altogether. This sl
opening will not be directly in th
center of the track, but to one side
the meridian line.

The current will be transmitted b
an ingenious contrivance from th
conductor underground to the m
tor in the car, and will be under i
stant control of the driver or en
neer. At intervals of eighteen fe
plates will be arranged over the co
duit, which may be readily remov
for repairs and other work, and wi
out removing the body of the c
ductor. The bottom of the cond
will be cemented previous to filli
in the ground about it. A speed
seven to ten miles an hour is clain
for the experimental Ridge aven
line, and a saving of $2.50 to $3
car over horse-power. The en
neers are sanguine of the success
the electric street railway.

BALTIMORE.

"The various trials of the
electric motor on the Union L
Track, Baltimore," says the *Elec*
cal Review, "have been so succe
ful that cars are now to be run re
larly. Fifteen miles an hour was
rate of speed at a recent test. C
siderable trouble has been caused
the contact of animals and hun
beings with the middle rail, whicl

highly charged with electricity. On Monday, several Hampden boys experimented with the rail and were severely stunned. A horse belonging to N. A. Cornelius stepped on the rail at Mount Vernon switch and was so shocked and surprised that he kicked the harness and shaft all out of repair. Another horse attached to a cart loaded with stone was knocked down by contact with the rail and badly cut. A horse belonging to W. H. Ortloff, a butcher, suffered the same fate, and, in expressing his feelings, he wrecked the harness. A flock of geese perched upon the electrified rail at Hampden Hall; they were knocked in all directions; one was hurled five feet in the air. A dog who witnessed the unusual commotion among the feathered bipeds, went to investigate the matter. As soon as he touched the rail he turned a double-somersault, and picking himself up, went off yelping. Notices have been posted along the track warning people to keep off the central rail."

It was upon the Union Railway that the recent experiment with the Bauer storage cells, noted in the August REVIEW, was made. From later information it appears that forty-nine cells were placed on the car, of which but twenty-nine were used on level ground and thirty-nine or forty-nine afterwards connected as the grade required. Eighteen persons were in the car, which, with the weight of the car, motor, etc., made a total of five and one-half tons. The car moved out of the yard, passing over grades of 235 feet to the mile, and around curves of 75 feet radius, with ease and comfort. The batteries of one-fourth horse-power each, were made for incandescent lighting but seemed to answer the purpose admirably. The loaded car made six miles per hour on level ground. The total value of the 49 cells used was 8.6 horse-power.

CLEVELAND, OHIO.

Since August last year the East Cleveland Horse Railway Co. has substituted electricity for horses as a motive power, and, notwithstanding the most trying ordeals, the experiment has been successful. In this system the electric conductor is placed in a conduit which runs between the rails. This conduit is slotted throughout its length and a conductor from the car is thus enabled to gather up the electric force. The conduit is kept clean automatically and provision is made for removing snow from the tracks.

DENVER.

In Denver, experiments of a thorough and costly nature are being made, to determine the best system for use on the line already constructed by a company of capitalists. Prof. Thompson, the electrician of the company, has not determined upon the system to be employed as yet.

CANADA.

The Vandepoele Company of Chicago, whose motors and generators are used on the Kansas City line, has secured a contract for building an electrical railway at Toronto, Ont., to carry the passengers to the coming Industrial Exposition there. The railway which the Vandepoele Company had there last year, an experimental one, is said to have been a perfect success, and to have carried 200 passengers to each train. The present railway will be extended to the city railways, and it is to become a permanent institution,

GREAT BRITAIN.

Probably the first Electric railway constructed in Great Britain, was the one running from Port Rush to Bushnells, near the Giants Causeway, in the north of Ireland. This system derives its power through the rails, and, while expensive and crude is very interesting, and, it is said, pays good dividends on the investment.

Several tramways, as the English call them, are either in operation or in process of construction in England. Among them may be mentioned the Blackpool Electric Tramway, lately completed. One of the cars built for this road, now running at the Inventions Exposition, has carried as many as 2,200 passengers in one day. Unfortunately the Board of trade has refused to allow the road to be opened, on account of faulty construction.

Another venture in this line is the Bessbrook and Newry Electric Tramway, on which the recent accidents occurred during an experimental trip. The accident was almost a duplicate of the cable-road accident on the inclined plane, in Kansas City; the brake apparatus did not work and the car shot down a grade with tremendous speed. The electric power had been cut off and hence the motors could not be reversed.

The *Telegraphic Journal and Electrical Review* (English) describes a new electrical locomotive as follows: "We understand that there is at present in the works of the North Metropolitan Tramway Company, an electrical locomotive intended for use upon that company's line. This engine has been running on a private line for several week's, and, so far, satisfactorily. The locomotive is ten feet long by six feet wide, and externally is very much like the steam locomotives at Stamford Hill. The system adopted is that of using accumulators as the motive power, and the laminated armature of the motor is of Walker's construction, having eight divisions and 31 coils. With a current of 38 Amperes, and at 800 revolutions per minute, the motor developes 32 horse power, its weight being 287 pounds."

It is rather difficult to determine what it is that weighs 287 pounds. A motor of that weight would scarcely give that much power, and the accumulators necessary to produce the power, would certainly weigh more than 287 pounds.

In the system just noted the gearing is upon Elieson's lever-transmission patent. The motor revolves upon an axle which communicates motion to the driving wheels through a set of differential mitre wheels, the speed ratio bing 1 to 8.5. The reversing motion is accomplished by means of clutches upon these wheels, the motor revolving always in the same direction.

The Reckenzaun system, wherein the electric force is supplied from accumulators, may be briefly described as follows: There are two motors driving each car, of nine horse power each, and each weighing 420 pounds. Each motor rests upon a bogie, one axle of which is a driving axle, both bogies thus giving four small driving wheels. The necessarily high speed of the motors is reduced by means of a worm on each motor-shaft and worm wheels on the driving axles, which gives a ratio of about 1 to 12. Speed and power are varied by means of a compound switch which arranges the motor circuits, so that the machines shall work in series. The driver uses one hand for all the operations of starting, stopping and varying the speed or power. There are two brakes, one the old form the other electrical.

THE CONTINENT.

The Siemans Electric Railway, constructed in the suburbs of Berlin, is one of the most successful and satisfactory thus far constructed. In this system the conductor is a hollow tube erected on posts beside the track. This tube has a continuous slit in its under surface through which brushes are introduced and dragged along to gather up the electrical energy. Wires are attached to the brushes, and conduct the power to a motor in connection with the shaft of the driving wheels.

This system is similar to that of Mr. J. C. Henry, of Kansas City, insofar as the conductor is carried on supports along the track. But the sliding contact of the brushes causes "sparking" and consequent deterioration and waste in the conductors as well as the brushes. Mr. Henry's device is a rolling contact which does not cause "sparking."

The *Electrical Review* (N. Y.,) calls attention to an excellent example of an important electrical mineral line. "This line is now in operation at the Paulus-Hohenzollern Collieries in Upper Siliesia. The line, which is 800 yards in length, has been constructed for a traffic of 400 tons of coal in ten hours. This result Messrs. Siemens and Halske have guaranteed. The electrical locomotive weighs two tons; it is controlled by a specially devised regulator, which is said to give great satisfaction to those in charge of the train, by its prompt and certain action. The insulated conductor consists of flat iron bars, galvanized at the ends and connected by means of fish plates. This conductor is suspended from the roof upon insulators. Brushes on the locomotives take the current from the conductor.

The line is connected with the generator by cables about 250 yards long. The generator is driven by a belt from the flywheel of an engine. The trucks weigh 10 cwt. each, and have a capacity of 11 cwt. The train is composed of fifteen trucks, so that the useful load hauled is a little over eight tons, and the whole load nearly sixteen tons. With this load a speed of seven and a half feet per second is reached. With an empty train the speed is 12 feet a second. At present the output is not sufficient to require the maximum transport of five hundred tons a day."

There are several lines in operation or projected in and about Paris. Probably the most useful of these is the one which has been in operation for several years, to the bleach-fields of *Breuil en Auge*. It transports the linen to the grounds with a cleanliness that could not be expected if steam were used. In this system 60 Faure accumulators, carried in the tender of the train, provide the electro-motive force.

In conclusion it is hardly possible to predict the extent and importance of the uses to which electro-mtoive force may be hereafter applied.

No one who is informed on the subject will maintain that there is a doubt of its successful application to motor purposes on street railways.

PRE-HISTORIC AMERICA.*

This is a companion volume to its learned author's "Les Tremiers Hommes et les Temps Pre-historiques," which dealt with the Stone Age in Europe. There is no lack of treatises in both English and Continental languages on this latter subject, and the expositor has the easy task of treading in well-worn footsteps. The uniform character of the relics of Palæolithic man, unearthed in thousands from river-gravels and bone caverns, has left little play for archæological vagaries or few speculative fancies concerning their makers. But it is otherwise with the pre historic races and those often stupendous relics of the New World which have long been looked at through the magnifying and tinted glasses of the romancer and the sciolist, and have been invested with the glamour and mystery in which ignorance covers its nakedness.

"Among the crude and imperfectly-digested hypotheses which have engaged the attention of untrained ethnologists, none have been more popular than those which ascribed the origin of the Americans to full-fledged races, such as we know at present in other regions of the world. Among those who have been claimed as the original or genuine ancestors of the Americans are the Chinese, the Japanese, the Malays, the Egyptians, the Phoenicians, the Basues, the ten lost tribes of Israel, the early Irish, the Welsh, the Norsemen, some unknown Asiatic Freemasons, and other equally unknown Buddhists. Volumes have been filled with the most enthusiastic rubbish by men upon whose ability and sanity in other matters, nothing has ever thrown a "doubt. Fortunately the era of such speculations is passing away. The scientific treatment of anthropological subjects is no longer the exception."

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*From Knowledge for July.

"The "ten lost tribes" still linger with us, and doubtless will continue to do so for some time, probably becoming in their turn the subject of investigation by psychologists interested in aberrant mental phenomena. But every day increases our knowledge of the true constitution of savage society, and builds a more enduring barrier against the floods of pure hypothesis."

The foregoing extract is a guarantee that we have in the present work a sober contribution to a subject which, under the treatment it now receives, falls into its relative place in the general science of human culture. M. de Nadaillac's volume covers more ground than the title indicates, the larger part of it, and that necessarily the most copiously illustrated, having more interest for the antiquarian than for the anthropologist; but in the earlier and latter chapters, as well as in references to cosmogonic legends and practices scattered throughout the work, the anthropologist will find enough and to spare of interesting and suggestive matter.

In all that the author and his American editor (from whose revision the book has largely gained) have to say concerning the co-existence of man with mammals now extinct, concerning the character of his earliest known relics and the deposits in which they occur, concerning his place in the geological record, the reader will be struck with the parallelisms between pre-historic peoples of the Old World and the New, with the proofs of the strictly analogous phases of culture through man has everywhere passed in his ascent from savagery, and with the absence of any essential physical difference between races, their unity, as the author remarks, "standing out as the great law dominating the history of mankind." Of course they did everything on the biggest scale in America from the earliest times. The kitchen middens, or refuse and offal heaps which are scattered along the shores of the Baltic, although of considerable size, are very "small pumpkins" to the like shell heaps and samboquis along the Atlantic and Pacific coasts, some of which cover many acres and reach a height of forty or fifty feet; the more remarkable mounds, to be referred to presently, are, compared to the tumuli of the Old World, as the Himalayas to the Mendip Hills; the pyramids challenge comparison with the famous pyramid of Cheops;

the palaces vie with the classic ruins of the Palatine; and the megalithic remains would enclose a mightier ruin than the broken circle of our Stonehenge. In the summary of evidence concerning man's antiquity in America, the cautious spirit in which the author approaches the problem is apparent. He has not listened to the charming of the French Savans, who find human relics in the middle tertiaries in Europe. Although agreeing that man lived before the glacial epoch in North America, he recognizes the difficulty of fixing the precise time of his appearance, and in the uncertainty which attaches to the exact deposits in which certain relics of him—notably the Calaveras skull—occur, wisely leaves the question open. But the main interest of the volume gathers round the exhaustive account which the author gives of the thousands of artificial mounds in the great river valleys south of the Rocky Mountains, and along the Gulf of Mexico, through the length of the Southern Continent. They appear to have little or no relation to the burial mounds scattered over Europe and Asia, and which are referred to pre-Aryan tomb-raising peoples, being unlike in their fantastic shapes, and apparently intended for defensive and sacrificial, as well as sepulchral purposes. Many of them are of geometrical form, oval, square, round, more rarely, polygonal or triangular, either rising from hill summits, or stand-solitary on plains, or enclosed within earth-walls. In some parts of the far West, the mounds represent mammals, birds and reptiles; indeed, some bold architects have not hesitated to attempt to imitate the human body. In Wisconsin "they represent men with the trunk, head, arms, and legs still recognizable; mammals sixty-five yards long; birds with outspread wings measuring more than thirty-two yards from tip to tip; reptiles of colosal dimensions, and, lastly, Pigeon mentions having seen in Minnesota a huge spider, whose body and legs covered an acre of ground." The cyclopean character and varied forms of these mounds led superficial inquirers to attribute them to some mysterious race of "giants in those days" which has completely disappeared, and with which the extant Indians of the Americas have no affinity. That the works are of a vast and undetermined antiquity is unquestioned, for as with the rough measurement of the deposition of remains beneath the successive layers of trees in the Danish peatbogs, the lapse of a long period is evidenced by the generations of varieties of trees which cover the mounds. And if, as M. de Nadaillac points out, we look among existing tribes for the lineal descendants of the Mound Builders, we may look in vain, since the richest, the most cultured, and the most sedentary of the Indians existing when the white race poured into America like a resistless flood, have been destroyed; of many tribes none remain, of others, only a feeble remnant, which has readily adopted the methods and art of the dominant race. Nevertheless, the conclusion at which the author in agreement with the leading authorities, arrives, is that expressed by Dr. Brinton as follows:—"All these earthworks—and I am inclined to assert the same of the whole of those in the Atlantic States, and the majority of the Mississippi Valley—were the production, not of some mythical tribe of high civilization in remote antiquity, but of the identical nations found by the whites residing in those regions." To which may be added the opinion of Schoolcraft. "There is nothing indeed in the magnitude and structure of our western mounds, which a semi-hunter and semi-agricultural population like that which may be ascribed to the ancesters of Indian predecessors of the existing race, could not have executed." The state of relatively high culture which these races, while still in the Bronze Age, had reached, is described in a profusely-illustrated chapter on their tools and weapons, and to this succeeds a striking account of the ruined bee-hive-like pueblos or communal villages built in valleys once fertile, but now barren and deserted, or on cliffs accessible only by ladders or by steps cut in their sheer sides.

Such sites were obviously chosen, like those of the lake dwellers in Central Europe in the past, and in New Guinea and Central Africa to-day, for security against fierce and dangerous enemies. But, an enemy more irresistible than these—diminished rainfall through destruction of forests, and censequent barreness—effected the decay of these energetic dwellers in the rocks.

The ruins ot Central America and Peru; temples—scenes of revolting rites—and palaces obscured in the densest vegetation, statutes, idols, bas-reliefs, rock paintings and sculptures. the grotesqueness of the art unredeemed by any feeling ot the beautiful, Nature alone festooning them with her wild loveliness; the rise of the famous dynasties, Aztecs and Incas, are the subject of copiously-illustrated chapters, which narrate in easy flowing style the story of these ancient civilizations. In the final chapter, which is mainly the work ot the American editor, the origin of man in the New World is discussed, and the conclusion deduced from the general laws of geographical distribution and from the physical characteristics of the several races, is that he is not anthochthonous.

A Copious index completes the usefulness of a book which is indispensable to the anthropologist.

NATIVE AMERICAN DOGS.*

The impression that the domestic dog of the old world has descended from wild species distinct from the wolf may be well founded, but in America the evidence tends to prove that the Eskimo, and other domestic varieties of dogs were domesticated by the aborigines and used by them long anterior to the discovery of the continent by the Europeans, the varieties in question originating from the gray wolf or prairie wolf. First as to the Eskimo dog. From the following extract from Frobisher it appears evident that the Eskimo had the present breed of domestic dogs long anterior to the year 1577. Frobisher's account of the Eskimo themselves is, so far as we know, the first extant, and is full and characteristic. After describing the natives he goes on to say: "They frank or keepe certaine dogs not much unlike wolves, which they yoke together, as we do oxen and horses, to a sled or traile; and so carry their necessaries over the yce and snow from place to place; as the captive, whom we have, made perfect signes. And when those dogs are not apt for the same use, or when with hunger they are constrained for lack of other vituals, they eate them, so that they are as needful for them in respect of their bignesse as our oxen are for us."

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*From the American Naturalist for September.

Regarding the Eskimo dog, Richardson remarks in his Fauna Boreali-Americana, p. 75: "The great resemblance which the domestic dogs of the aboriginal tribes of America bear to the wolves of the same country was remarked by the earliest settlers from Europe (Smith's Virginia), and has induced some naturalists of much observation to consider them to be merely half tamed wolves (Kalm). Without entering at all into the question of the origin of the domestic dog, I may state that the resemblance between the wolves and the dogs of those Indian nations, who still preserve their ancient mode of life, continues to be very remarkable, and it is nowhere more so, than at the very northern extremity of the continent, the Esquimaux dogs being not only extremely like the gray wolves of the Arctic circle, in form and color, but also nearly equaling them in size. The dog has generally a shorter tail than the wolf and carries it more frequently curled over the hip, but the latter practice is not totally unknown to the wolf. * * * I have, however, seen a family of wolves playing together, occasionally carry their tail curled upwards."

The Hare Indian dog is also supposed to be a domesticated race of the prairie dog, as shown by the following extract from Richardson's Fauna Boreali-Americana, "*Canis familiaris* var. *B lagopus*. Hare Indian dog. This variety of dog is cultivated at present, so far as I know, only by the Hare Indians and other tribes that frequent the border of Great Bear Lake and the banks of the Mackenzie. It is used by them solely in the chase, being too small to be useful as a beast of burden or draught." It is smaller than the prairie wolf. "On comparing live specimens I could detect no marked difference in form (except the smallness of its cranium), nor in fineness of the fur, and arrangement of its spots of color. * * * It, in fact, bears the same relation to the prairie wolf that the Esquimaux dog does to the great gray wolf."

Another variety of Indian dog is Richardson's *canis familiaris* var. *D novæcaledoniæ*, Carrier Indian dog. The Attnah or Carrier Indians of New Caledonia possess a variety of dog which differs from the other northern races. "It was the size of a large turnspit dog and had somewhat of the same form of body; but it had straight legs, and its erect ears gave it a different physiognomy."

The spitz dog, Mr. J. A. Allen informs us, is with little doubt a domesticated subarctic variety of the prairie wolf.

Sir John Richardson in the Appendix to Bock's Narrative, Paris, 1836, p. 256, remarks: "Indeed, the wolves and the domestic dogs of the fur countries are so like each other, that it is not easy to distinguish them at a small distance; the want of strength and courage of the former being the principal difference. The offspring of the wolf and Indian dog are prolific, and are prized by the voyagers as beasts of draught, being stronger than the ordinary dog."

The origin of the ordinary Indian dog of North America is obscure, but Richardson, who names it *Canis familiaris* var. *C canadensis*, North American dog, throws much light on its origin:

"By the above title I wish to designate the kind of dog which is most generally cultivated by the native tribes of Canada, and the Hudson Bay countries. It is intermediate in size and form between the two preceeding varieties, and by those who consider the domestic races of dogs to be derived from wild animals, this might be termed the offspring of a cross between the prairie and gray wolves. * * * The fur of the North American dog is similar to that of the Esquimaux breed, and of the wolves. The prevailing colors are black and gray, mixed with white. Some of them are entirely black. * * *"

He quotes from Theodato "Canada," written in 1630, to show that at that early period, and "perhaps even before the arrival of Europeans, they formed an esteemed article of food of the natives." Confirmatory of the theory of the Pre-columbian origin of the Indian dog, may be cited the following extract from Hakluyt's voyages regarding the Indian dogs seen on Cape Breton island, p. 1593:

"Here divers of our men went on land upon the very cape, where, at their arrival they found the spittes of Oke of the savages which had roasted meate a little before. And as they viewed the country they sawe divers beastes and foules, as blacke foxes, deere, otters, great foules with red legges, pengwyns, and certain others. * * * There-upon nine or tenne of his fellows running right up over the bushes with great agilitie and swiftness came toward us with white staves in their hands like halfe pikes, and their dogges of colour black not so bigge as a greyhounde followed them at the heeles; but we retired into our boate without any hurt at all received." (The voyage of the ship called the *Marigold* of M. Hill of Redrise unto Cape Breton and beyond to the latitude of 44 degrees and an half, 1593, written by Richard Fisher Master Hilles man of Redriffe. Hakluyt, III, 239).

It is probably this variety, the bones of which have been found by Dr. J. Wyman, in the shell heaps of Casco Bay, Maine. The presence of the bones of the *dog* might be accounted for on the score of its being a domesticated animal, but the fact that they were not only found mingled with those of the edible kinds, but like them were broken up, suggests the probability of their having been used as food. We have not seen it mentioned, however, by any of the earlier writers, that such was the case along the coast, though it appears to have been otherwise with regard to some of the interior tribes, as the Hurons. With them game being scarce, "venison was a luxury found only at feasts, and dog flesh was in high esteem."* * * A whole left half of the lower jaw of a *wolf* was found at Mount Desert, measuring 7.5 inches in length, making a strong contrast in size, with a similar half from a dog found at Crouch's cave. This was more curved, and had a length of a little less than five inch (Amer. Nat. I, 576, Jan. 1868). is possible that the Newfoundla dog was indigenous on that islan and also an offshoot of the gray wo allied to the Eskimo. In their "Ne foundland" Messrs. Hatton and H vey say that there are few fine spe mens of the world-renowned "Ne foundland dog" to be met with n on the island, from which it deriv its name. "The origin of this fi breed is lost in obscurity. It is doul ful whether the aboriginees possess the dog at all; and it is highly i probable that the Newfoundland d is indigenous. Some happy crossi of breeds may have produced it he The old settlers say that the ancie genuine breed consisted of a d twenty-six inches high, with bla ticked body, gray muzzle, and g or white stockinged legs, with d claws behind." Judicious treatm has greatly improved the bre "Their color is white, with bl patches, curly coats, noble heads powerful frames. The favorite N foundland dog at present, is entir black, of large size, from twenty to thirty inches in height, remar ble for his majestic appearance. is now generally admitted that th are two distinct types of the N foundland dog, one considera larger than the other, and reck ed as the true breed; the ot being named the Labrador or John's, or Lesser Newfoundla The latter is chiefly found in L rador, and specimens are also be met with in Newfoundland," pp. 194-195.

Regarding the dogs of the Mexican Indians, Nadaillac says in his Prehistoric America: "The European dog, our faithful companion, also appears to have been a stranger to them. His place is very inadequately filled by the coyote, or prairie wolf, which they kept in captivity and had succeeded in taming to a certain extent."

In a recent visit to Mexico, not only along the railroads, but in the course of a stage ride of about five hundred miles, through provincial Mexico, from Saltillo to Don Miguel, we were struck by the resemblance of the dogs to the coyotes; there can be little doubt but they are the desendants of a race which sprang from the partly tamed coyote of the ancient Mexican Indians. At one village, Montezuma, we saw a hairless or Carib dog as we supposed it to be; similar dogs are sometimes seen in the United States.

Finally that the domestic dog and gray as well as the prairie wolf, will hybridize has been well established.*

DICKENS AND THACKERAY.

[From Knowledge, June, 1885.]

Mr. Thurlow Weed, the American politician, once expressed surprise at the circumstance that in England Dickens does not seem to be at present held in such high esteem as in America. He remarked that, to him, there seemed no comparison between Thackeray and Dickens, so far at least as their power of enchaining the attention was concerned. I propose to point out some considerations which appear to me to justify the opinion which is now generally entertained in England respecting Dickens' writings. It also should, however, be understood that those who recognize most clearly the shortcomings of Dickens even as a humorist (using this word in the wide sense in which Thackeray has employed it in his lectures on writers of the last century), feel too deeply the debt of gratitude the world owes to Dickens, to desire in any way to be-little a name which men will always hold in high esteem.

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*Dr. Cones has observed hybrids between the coyote and domestic dog on the upper Missouri (see the American Naturalist. 1873, p. 385). To this we may add our own observations made at Fort Clagget on the Upper Missouri in June 1877. We then were much struck by the wolf-like appearance of the dogs about an encampment of Crow Indians, as well as the fort; they were of the size and color of the coyote, but less hairy and with a less bushy tail. They were much like those lately observed in Mexico, and I have never seen such dogs elsewhere. Their color was a whitish tawny, like that of the Eskimo dog.

Confirmatory of these observations is the following note by J. L. Wortman, in the report of the Geological Survey of Indiana for 1884: "During extended travel in Western U. S. my experience has been the same as that recorded by Dr. Cones. It is by no means uncommon to find mongrel dogs among many of the Western tribes, notably among Umatillas, Bannocks, Shoshones, Arrapahoes, Crows, Sioux, which to one familiar with the color, physiognomy and habits of the coyote, have every appearance of blood relationship, if not, in many cases, this animal itself in a state of semi-domestication. The free inter-breeding of these animals, with a perfectly fertile product, has been so often repeated to me by thoroughly reliable authorities and whose opportunities for observation were ample, that I feel perfectly willing to accept Dr. Cones statement."

To these statements may be added that of Milton P. Pierce. published in Forest and Stream for June 25, 1885, as follows: Hybrid wolves have always been very common along our Western frontier. I have seen several of them, sired both by dogs and wolves, and all I have seen have resembled wolves rather than dogs." It is to be hoped that our mammalogists may collect and examine this subject, particularly the skulls and skins of numerous specimens both of dogs and wolves and of the hybrids betweed them. Further observations are also needed as to the fertility of the hybrids.

It may be convenient, though there are objections to such a course, to follow Mr. Thurlow Weed in making comparisons between Dickens and Thackeray. It will be noticed that though he says there is no comparison he, in that very remark, makes very definite comparison between the two writers. The practice of instituting such comparisons is not a pleasing one. We may praise, or, if occasion arise, blame, a writer, a painter, a sculptor or a man of science, without inquiring whether he deserves more or less praise or blame than some other worker in his own line. I have noted cases where comparisons, unnecessarily introduced into criticisms, seem as though specially intended, as certainly they are calculated, to excite ill-will between the persons compared; and it would be well if a system of criticism were adopted from which all such comparisons should be rigidly excluded as michievous and offensive. But in considering the work of two such writers as Dickens and Thackeray comparison can hardly be avoided, though often the study of their writings suggests rather contrast than comparison.

So far as the construction of their stories are concerned, neither Dickens nor Thackeray has shown special skill. But there is one marked difference between them in this respect: Thackeray deliberately rejected the old fashioned method of constructing a plot. His stories are pictures from real life, and were meant to be such. He no more attempts artistic arrangement than Hogarth aimed at color effects in his paintings. In fact, at times, when he finds his events moving towards an effective situation, Thackeray deliberately interrupts the current of his narrative to call attention to the opportunity thus offered for fine writing, of which, however, he refuses to avail himself. I could cite several instances, but will content myself by mentioning the scene where Philip Firmin breaks in upon a group of angry persons on Mme. Smolensk's staircase. "Here, I protest," he says, or to that effect —"here, I protest, is a fine situation," and he proceeds to sketch in the details; but in order rather to make a grotesque than an effective situation—though there are few passages more beautiful than the closing lines of that description.[1]

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[1] On this point Mr. Proctor differs from many competent critics. It has been generally supposed that Dickens took more liberties with the traditional form of English fiction than Thackeray. Without reference to the fact, remarked by M. Taine, that neither of these Masters ventured to shock public opinion by portraying the passion of love in an unconventional manner, it may be asserted confidently, that Thackeray's genius and education led him to accept the literary heritage left by preceding English novelists, much more fully than his great congener. It is true, as noted by one of his critics, that his novels have the misfortune of recalling those of Miss Edgeworth; and it is none the less true that De Foe and Swift sometimes more than whisper

With Dickens the case is altogether different. It is true that "Pickwick" was purposely written without any definite plot; but Dickens was then writing to order. In all his other stories he manifestly aimed at the construction of an attractive plot, after the old fashioned manner, the story to come to a close with the marriage of the hero and heroine, the good characters to get their proper reward, the villains to be duly punished.[2] He not only failed, but it is noteworthy that not one of his heroes or heroines, and scarcely one of his very good and very villainous characters is well painted. His heroes, indeed, are, for the most part, like that youth of the Chuzzlewit family, who had no outline, or rather they may be described as Mantalini described two of his imaginary conquests, of whom one "had no outline at all," and the other "had a demned outline." Clennam and Walter Gay are of the no outline sort; Nickleby, Harmon and Chuzzlewit belong to the other category.[3]

It is in fact in the presentation of character that the contrast between Thackeray and Dickens is most marked. It appears to me that Thackeray stands among the very first of our English writers in this respect, even if, so far as novel writing is concerned, he is not absolutely first. Macaulay would have set Jane Austen before Thackeray, because of the skill with which she delineated characters closely akin. But the range of Miss Austen's portraiture was so small compared with that of Thackeray's, that he must be set above her on this account alone, unless it could be shown that she would have been as successful on the large scale as she certainly was in the few cabinet pictures on which she excercised her powers.[4]

I am particularly struck by Thack-

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from his pages. But, with all its beauties and faults, who has yet found in Dickens' style, or motive, the unmistakable signs of a literary heirship or serfdom. Even the very instance of Mr. Thackeray's self-denial, Mr. Proctor adduces, is purloined, so to speak, from an earlier writer.

W.

[2] Mr. Thackeray's critics have said the same thing about him, and with perfect truth. Even in the only good novel, as a novel, that he wrote (Henry Esmond), there must needs be a happy marriage of the hero and heroine to close the account; though the heroine was several years the elder of the two. And it might be asked of Mr. Proctor, in what novel of Thackeray does the villain remain unpunished, the hero unrewarded. Col. Newcome don't count—it is a common trick with novelists, (as with the world at large), when their heroes ask for bread to give them a stone.

W.

[3] Let us compare these characters of Dickens with some parallel characters of Thackeray. Set against Clennam and Gay (who, by the way, are only intended to take perfunctory parts) J. J. and Frank Castlewood; against Nickleby, Harmon and Chuzzlewit, set Clive Newcome, Warrington and George Osborne; is there such a marked superiority in Thackeray as Mr. Proctor's slighting reference would imply? It may be confessed, once for all, that Dickens discovered his characters in humble life; that his portrayal of "gentlemen" and "ladies" (God save the mark! if Thackeray's presentation of English gentility is correct) is not flattering to the "caste of Vere de Vere"; that the great crowd of familiar faces which peer from his pages are characterized too strongly in some direction or other, to be met with in real life; yet his creations are true to Art and, therefore, true to nature. If a painter should attempt to characterize Murder, would the figure depicted on the canvass be a commonplace man in blouse and pantaloons with a slung-shot in his hand? Dickens' mind was essentially poetic, essentially northern. The old English poets were nearer to him in inspiration than any writer since Elizabeth. His characters were embodiments of isolated vices, passions, propensities, weaknesses and virtues. As such they are presented to us; as such we remember them, and as such we apply them in thought and word to those around us. The wonder is that these characters, these abstractions, should be given such a human interest, such a plausable, flesh-and-blood appearance, that we can scarcely rid our minds of the idea that they actually lived.

W.

[4] It is curious that Thackeray should be commended for the very virtue in which he is certainly most deficient. It is not in the portraiture of character that Thackeray is greatest: Jane

eray's skill in giving life and reality to his leading characters (we must not say heroes and heroines, since Thackeray tells us he knew of none, and pretended to describe none), because it is in this novelists chiefly fail. What a vague and shadowy set are Scott's heroes and most of his heroines, though it must be admitted that Rebecca, Di Vernon and Julia Mannering are charmingly delineated. On the contrary, Esmond, the two Virgianians, the other Warrington, Pendennis, Clive Newcome, Philip Firmin and dear old Dobbin—all these are men, not (like most of our story heroes) mere names tacked on to descriptions with which they do not in the least correspond.[5]

But even more striking, though less generally recognized, or in general denied altogether, is Thackeray's power of portraying women. I find it perfectly amazing that so many deny Thackeray's power in this respect, where he is almost without a rival. Repeatedly we hear it said that he could only draw two sorts of women —Becky Sharpes and Amelia Osbornes—apart, that is, from subordinate characters.

It is noteworthy that women hold this opinion; indeed, I am not sure that they are not responsible for the opinion that all Thackeray's amiable women are fools and all his clever women rogues. Yet no opinion could be much further from the truth. Theo and Hetty Lambert suffice as illustrations of Thackeray's power in delineating amiable women who are not fools and clever women who are not only not rogues, but of sweet and attractive dispositions.

In Ethel Newcome we have the two qualities combined in still more marked degree. Surely, by the way, there is no more charming picture than that of Ethel Newcome, infinitely more attractive, with all her faults than she would have been without them, and without her noble and touching repentance.

What strikes me most in Thackeray's portraiture of women is that even those among his female characters who belong to the same category are so clearly discriminated. Amelia Sheldon is an amiable non-

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Austen, or Miss Edgeworth, or Richardson could easily vanquish him in that field. Confessedly he limned his characters, such they were, with skill; but as they were all used as the stage setting for the effectual use of satire and irony and, occasionally, wit of even coarser texture; as lay figures to be dressed up as butts for ridicule; men of straw to be jibed at, kicked, pounded, pulverized amidst the hurrahs of the audience; there is nothing so very wonderful in his skill. I don't think it remarkable that a writer who could so brutally insult his female characters (characters, too, only bad from training) whenever they are brought upon the stage, should show a marvelous acquaintance with the side of English high-life depicted by him. W.

[5] Whew! I should like to ask Mr. Proctor if he ever, in the whole course of his life, met one Esmond. As for the two Virginians, they are absurd as pictures of real life; they seem to me more like the pictures painted on old-fashioned dinner plates, where trees, houses, dogs and men are all of the same size and of very much the same appearance. Pendennis, the son of a country doctor, deeming himself of gentle blood through his mother, commences a career of intolerable snobbery by airing his gentility, and yet making a fool of himself over an ignorant actress whom he wishes to marry. Clive Newcome, a most improbable character in many respects, is thoroughly Thackeraynian in making an ass of himself by posing as a martyr before Ethel Newcome after marrying poor little Rosey. And, for Heaven's sake! what spot on earth holds another Philip Firmin? Is it possible that such boorishness and refinement, ignorance of the world and god-like sagacity, strength aad weakness, good sense and silliness are wedded in any real person. W.

entity, and so is Rosey Mackensie; but no one would ever mistake one for the other or either for Fannie Huxter. There is, in fact, no more resemblance between the two than there is between Rosey's fit of jealousy when Ethel Newcome brings the news of the letter found in Orme's History and Amelia's jealous love for that young pickle, her son. Again, Laura Pendennis and Charlotte Bayham are both amiable girls, both bright and intelligent, though neither is particularly clever, but they are no more to be mistaken for each other than Captain Costigan for General Bayham or for Colonel Newcome.

So with the unamiable ladies. Apart from the difference between the social condition of Becky Sharp, Blanche Amory and Fannie Mountain, they are perfectly distinct in character, though all are clever and unscrupulous, all seductive rather than attractive. Unlike these in nearly all respects, though belonging to the same category, is Beatrice Castlewood, just as Lady Castlewood is unlike all Thackeray's other amiable women (nearest, perhaps, to Helen Pendennis) and Clara Pulleyn unlike all those of the class to which she belongs.

The development of Mrs. Mc Kensie's character from mere vulgarity to viragoism is worked out with surpassing skill. As other illustrations of Thackeray's skill in this direction I would mention the ladies of the Castlewood family and the two daughters of Sir Miles Carrington.

Thackeray seems to have taken keen delight in picturing good mothers. By the way he was a great admirer of Steerforth's mother, in "David Copperfield," the only lady in Dickens' novels.[6] A writer in the *Atlantic Monthly* a few years since said of Thackeray that he had given us scarcely any mother-characters; the *Atlantic* writer admitted, indeed, that Thackeray had given some good mothers but, oddly enough, wrote as though two good mothers were neutralized by one bad one. I fancy I could name a score at least of mothers in Thackeray's novels without considering those in the "Snob Papers," "The Hoggarty Diamond," "The Bedford Row Conspiracy," "Our Street," etc., the wonderful mothers in "The Raven's wing," and "Barry Lyndon," or the sketches in "Denis Duval."

In "Vanity Fair" we have at least five mothers—Amelia Osborne, Mrs. Sedley, Lady Southdown, Mrs. Bute Crawley. and Mrs. Becky Crawley (*nee* Sharp) herself—to count only those who are depicted as mothers, good, bad, or indifferent. Mrs. Major O'Dowd views her military family in so motherly a way that she might almost be counted among Thackeray's mothers. In "Pendennis" we have four mothers; Helen Pendennis, the Begum, Harry Foker's "mum," and Fanny's foolish mother—not to count the mother of Mdle. Caracole, or whatever the lady's name who adorned Foker's Richmond party. In "Esmond" there is only one "full length" mother—Lady Castlewood, (a singularly skillful drawing, by the way, if the difficulty of the subject is considered); but in its sequel—"The Virginians"—there are at least six admirably discriminated pictures of mothers—Rachael Warrington, Mrs. Mountain, Lady Castlewood the second, Mrs. Lambert, Mrs. George Warrington (*nee* Lambert) and Lady Warrington. In the "Newcomes" mothers are still more numerous. There are no less than eight—Lady Newcome, Mrs. Hobson Newcome, Leonore de Florac, Laura Pendennis, Mrs. Mc Kenzie, Barnes Newcome's unhappy wife, Lady Walham and Lord Farintosh's mother (remarkable as having been resuscitated by Thackeray, who had killed her and forgotten all about it). In the "Adventures of Philip" (with the "Shabby Genteel Story") there are six mothers—Mrs. Gann, dear Caroline Brandon (Philip is her own child we know) Mrs. Brandon Firmin, Mrs. Philip Firmin, Mrs. General Bayham and Philip's first threatened mother-in-law, Mrs. Twysden—all admirably sketched, though some with only a few masterly strokes. In "Lovel the Widower," there are three mothers, all taking active parts in that wonderful scene which follows Lovel's declaration. In all no less than thirty-three admirably delineated mothers (doubtless I have overlooked several) by the writer, of whom it has been absurdly said that he could never draw a woman.

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[6] This is a queer assertion, but there is no doubt that Steerforth's lady-mother was more to the mind of Thackeray than any of the mere women portrayed by Dickens. It is sometimes startling, from an American stand-point, to discover an English definition or characterization of what constitutes a lady. Of course Proctor means that Mrs. Steerforth is the only aristocratic woman portrayed by Dickens; but he certainly forgets Mrs. Skewton and her daughter, Mrs. Dombey, Lady Dedlock and Emma Haredale. W.

But while Thackeray's success in delineating characters ordinarily met with in the world must be admitted by all who give the matter a thought, there are many who deny to Thackeray the power which Dickens is regarded as possessing in a very eminent degree—that, namely, of delineating such strange and whimsical characters as are less frequently met with.

Probably, if Thackeray had allowed himself the same license as Dickens in such matters, he would have been as successful in presenting in an amusing manner the grotesque, the fanciful, and the weird. The license I mean is that of combining in the same character incogruous characteristics.

This license, indeed, Dickens took with characters of all orders; and not only so, but he took the further license of distributing among different characters the peculiarities of one and the same person whom he knew in real life. For instance, we know that some of the peculiarities of Micawber were copied from what Dickens had seen in his own father, while others were taken from other originals. So Mrs. Micawber has many ways which Dickens had noted in his own mother, while others of her peculiarities were not such as characterized Mrs. John Dickens. But we find also that while the oddities of Micawber and his wife were borrowed from different sources, so the characteristics of Dicken's father and mother were distributed among different characters—Mr. and Mrs. Nickleby, Mr. and Mrs. Micawber, and so forth.

One of the most remarkable illustrations of Dicken's manner in such matters, a manner unquestionably resulting from deficiency of the creative faculty (which, until the real origin of many of his characters had come to be known, was mistakenly supposed by inexperienced readers to be possessed by Dickens in a large degree), is to be found in Dora and Flora. Copperfield's first meeting with Dora is Dicken's meeting (when little more than a boy) with a lady by no means so young as Dora is there represented. The courtship is derived from his youthful love for the original Flora. The married life of Dora, so far as her household ways are concerned, presents Dickens' own experience, so that Dora there represents a third person, and that person his wife. And lastly the death of Dora, and Copperfield's sorrow during the following years, are drawn from the death of his wife's youngest sister, Mary, and the sorrow of Dickens felt for years thereafter. Yet, though the real Flora furnished only one of these four copies from which the Dora of fiction was combined, we find her forming part of two distinct and very unlike characters, the characteristics of her latter years being in part reproduced in Flora—but only in part, for some of Dora's ways were derived from other sources.

Nor can it be said that, after all, Dickens so artisticcally combines and distributes what he had observed, that they become effective as if they were real creations. For no one possessing any power of critical discrimination can have failed to recognize the incongrulty of many—one may almost say of all—of Dickens' characters long before it became known that he had constructed them of heterogeneous materials and applied his materials to heterogeneous purposes.

Another remarkable illustration of Dickens' manner of writing, is to be found in a picture which is commonly, and in some respects justly, admired—the childhood and death of little Paul Dombey; yet the ways of the old-fashioned child, a child with whom Dickens had been exceptionally well acquainted (himself), while the latter scenes were, it is needless to say, taken from a different experience.

And here I feel tempted to remark on a peculiarity of Dickens' manner of treating his subjects which would of itself show that he did not belong to that class of creative writers which includes all the really great names of literature.

Paul Richter used to say "If an author has to stop and ask himself, 'what shall I make such and such a character, do or say at such and such a point in the narrative?' to the devil with him," implying that such an author may possess superficial cleverness, but no genius. I wonder what Richter would have said of an author who not only thus hesitated, as we find Dickens repeatedly did, but asked and took the advice of his friends about so critical a question as the fate of his principal characters, or even after writing the closing chapter of a story adopted, at a friend's suggestion, an entirely different conclusion?[7]

No one knew better than Dickens the requirements of true art. Nay, he often describes himself as living in his work and among the characters of his story, as the true artist should live; but it is certain he deceived himself, for if he had he could never have been in doubt what their fate was to be, and still less could he have modified, at the suggestion of those who were comparatively strangers to his creations, the fate which he had decided should be theirs.

I am aware that other novelists have on occasion done likewise. Scott, for instance, consented to restore Athelstane of Coningsby to life after he had killed him, and a fine mess Scott made of that change; but, even if we assigned to Scott the high position assigned him by contemporaries, it might still be answered that Athelstane was only a subordinate figure in the story, and that Scott would never have consented so to arrange matters to suit the popular taste—that the insipid Rowena should have disappeared and the gallant but shadowy Ivanhoe have married Rebecca, that most beautiful of Scott's creations.

It need hardly be said that Thackeray does not allow himself such license as Dickens in the portraiture of character. Not a line can be found in the pictures of Costigan, Huxter, Rawdon Crawley, Lord Steyne, and the host of varied characters which appear in Thackeray's pricipal works, which can be regarded as incongruous nor can I recall a single instance in which characteristics appropriate to one character are distributed among several. Again Thackeray never, so far as can be judged, departs from that natural sequence of events which the development of his stories has suggested to him.

Thackeray was content, in fact, to hold the mirror up to nature. I do not say that the portraiture was always perfect, still less that the work belongs always to the highest class. George Eliot seems to me to be as far in advance of Thackeray in many respects, as Browning is in advance of Tennyson. (For this reason, she will always be less popular than Thackeray, even as Thackeray is less popular than Dickens). But the work Thackeray undertakes is always good work, and it is always well done. He does not seek to please by effective situations, by bringing in *per fas et nefas* humorous or pathetic images, though his humour is true, his pathos deep and touching. Nor does he care to make his stories "end well" or even end at all?[8] They are slices from real life, and real life moves ever onward. His pictures, if not the finest, are among the best drawn of all that English writers have given us.

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[7] There is so much downright rot and pure assumption in these criticisms of Mr. Proctor, that it is not worth while to answer him; but the dictum of Richter, as Proctor must have known, did not apply to the case presented by him. If it is a literary sin to ask advice of friends, or to build up a character from heterogenous materials, we must bid farewell to Shakespeare, to Goldsmith, to Tennyson, to George Eliott, to Thackeray himself, for they are certainly damned. W.

I have already said much more than I intended when I began, yet I seem scarcely to have done more than touch upon my subject, so many considerations have I been obliged to omit which I had had in my thoughts. But there is one point which I must touch upon, though briefly, viz:, the quality of the language in which Thackeray and Dickens have expressed their conceptions. Here as it seems to me, the two writers hold a nearly equal position. Thackeray, it is true, wrote more accurately, at any rate in his latter works (for there is some very questionable English in his earlier writings). Dickens, indeed, repeatedly uses words in a wrong sense, and not unfrequently offends against the rules of grammar. He makes his worst mistakes when he aims either at fine or precise writing. Of the former we have a remarkable instance in a passage which Forster quotes with high approval, where Dickens speaks of a man being "an atheist in all the better feelings of our nature." Of the latter the most striking illustration which occurs to me at the moment is the passage where he says of Eugene and Bradly Headstone that "no matter who spoke or whom was addressed" they continued to watch each other. But despite mistakes such as these there is a singular charm about Dickens' English. The charm resides partly in its clearness, partly in liveliness of imagery, but chiefly I believe, in its perfect music. In order to appreciate Dickens' English fully, let some of the descriptions in his "Uncommercial Traveller" be compared with writers on similar matters, even by the ablest authors of the age. Of Dickens, indeed, we may say—though probably he himself would not have been disposed to admit as much—that "description was his forte."

Of the two writers Thackeray occupies far the higher position. His true place is daily becoming more clearly recognized. It will, I believe, be generally admitted before long that Charlotte Bronte' was not far from the truth, when she wrote (as nearly as I can recall the passage) that he was the foreman of that working body which sought to restore the warped order of things to rectitude. As she said, his wit is keen, his humour light, but they are no more by comparison with his serious power than the sheet lightning of the summer cloud compared with the scathing flash which leaps from its dark bosom ?[9]

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[8] This is astounding! I cannot recall an instance where Thackeray did not draw his novel to a close in the most approved and hacknied method, including the distribution of all necessary rewards, retributions, etc., etc. W.

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[9] It has grown to be a superstition with a certain class of writers, that in any comparison between Dickens and Thackeray the former must suffer and that, in fact, the superiority of the latter is so apparent that a certain amount of patronizing praise is necessary in the garish light of Thackeray's genius, to prevent the total eclipse of Dickens' fame. There is a strange fatality apparent in the contemporary fame of great men. What laughter would have pealed from clerkly throats in the time of good Queen Bess, if some parvenu in literature had suggested that the plays composed by an humble actor, one Will Shakespeare, were more worthy of fame than those of Ben Jonson; and would not the litterateurs of the time of King George the Third, have enjoyed the verdancy of one who asserted that Oliver Goldsmith would exert a more powerful and more enduring influence on letters than Dr. Samuel Johnson. So it was and so it is with Dickens.

The novel of Thackeray was a product of the times. It sprang from a condition of society, of thought, of taste, necessarily ephemeral. It pictured a phase of English life, narrow, insular, selfish, egotistical, which can only be interesting or useful to the people and the generation which gave it birth. It is a picture of manners, a book of etiquette, a chronicle of post-prandial bon mots, a manual for diners-out and literary snobs; in a word, it is a book for the time and not for all time. On the other hand the novel of Dickens is a picture of human life. Wherever, under the bending skies, the human race lives and moves and has its being, whether in the palaces and huts of the Orient, or the mansions and hovels of the West, in princely halls or Tartar tents, it has in Dickens a chronicler of its smiles and its tears, its beauty and its ugliness, its sublimity and its degradation. The men and women, youths and maidens and children we meet, in his pages, (and how familiar they are to us, how inseperable from the real people in our experience) are English in dress and speech alone. We have no gaudy Pendennises, no theatrical Clive Newcomes, no boorish Philip Firmins (look them up pray, good reader, if you have not met them) among our circle of friends; but, thank Heaven! there are Nicklebys, Copperfields, Martin Chuzzlewits, aye, and breezy, hearty, wholesome, Walters too. Ah, how they troop into remembrance, those citizens of the world—those "abstracts and brief chronicles" of human nature,—with the whole Pickwick Club as marshals of the day! Dear old friends, their creator has left to them the task of perpetuating his fame, and not to scribblers and penny-a-liners. Taine's words, in drawing a parallel between Balzac and Thackeray, may be paraphased as follows with perfect truth and justice: "When we have read to the end of Dicken's novels, we feel the pleasure of a naturalist walking through a museum, past a fine collection of specimens and monstrosities. When we have read to the end of Thackeray, we feel the shudder of a stranger brought before a mattress in the operating room of a hospital, on the day when cautery is applied or a limb is taken off." W.

EDITORIAL.

THE NEW STAR.

E. W. Maunder discussing the "New Star in the Great Andromeda, in the Observatory for October, says: It is premature, no doubt, to attempt to draw any very definite deductions from the present outburst; but it should always be clearly borne in mind that these "temporary" stars—and that this star may properly be classed as such is evident, for it is already fading—cannot be stars in the least resembling our own sun in size or structure. Could the radiations of the sun be suddenly increased a thousand fold, it would be absolutely impossible for it to resume its former scale of brightness within the course of a few weeks or months. The suddenness of the increase and sudden decrease of light, prove unmistakably that we have to do with bodies relatively minute, and therefore capable of rapid cooling. The only alternative—that the star has not really altered its lustre, but that some intervening screen has been temporarily withdrawn—seems inadmissable, especially in view of the spectroscope history of *T. Coronæ* and *Nova Syni.* Since, then, the distance of these stars is so great (for as yet an appreciable parallax has not been obtained for any one of them) and their brilliancy so high, we are compelled to substitute for a compact sun a loosely scattered, widely extending system of small bodies—a system similar in character. but on an indefinitely larger scale, to that which we see in the corona or in the rings of Saturn.

Another writer in the same magazine suggests that outbursts like that in Andromeda might be caused by some celestial body coming in contact with a gaseous Nebula, causing its light to be greatly intensified.

THE TAENSA LANGUAGE.

The controversy between Dr. Brinton and M. Adam arising out of the latter's book on the Taensa grammar and literature, does not seem to have been terminated by the reply of M. Adam to Dr. Brinton's criticism. In the October *Antiquarian*, Dr. Brinton returns to the attack without abating his personal distrust of the genuineness of the Taensa grammar and texts, as fathered by the French *Americaniste*, and alleges that Adam has retreated so far from his original position as to leave nothing in dispute but the authenticity of the grammar. As to this point the celebrated philologist, Friedrich Muller, says (translation) "I think, therefore, that the Taensa Grammar, in general, is genuine; that one can use it as the material to form a judgment of grammatcal structures; but it is better to avoid using this material so long as the original manuscript shall not be produced." At the conclusion of his reply, M. Adam avers that "*la France n'est point la terre classique de l'imposture et du* humbug"; to which Dr. Brinton makes the pertinent response that the only other kindred imposture to the one which Perisot is accused of, was perpetrated by a native of "la France"—George Psalmanasar.

THE AMERICAN ANTIQUARIAN.

One evidence of the continued prosperity of this valuable magazine, is given in the fact that it is absorbing various amateur journals, and surviving all competitors in the same department. The editor announces in the September number that the *Museum*, a monthly recently established in Philadelphia, has been merged into the *Antiquarian*, and that all of the contributions, correspondence, engravings and subscription list have been already transferred. A new department called the "Museum," devoted to the description of archæological relics has however been established, and Mr. E. A. Barber, the editor of the *Museum*, is to have charge of it.

Archæology is now the rising science, and it is a cause for congratulation that a magazine which is as safe and careful, and at the same time as progressive and scholarly as the *Antiquarian*, should be able to hold the field, and unite the workers of all classes.

TUBERCULOSIS IN CATTLE.

In a paper read before the Newport Natural History Society, Mr. J. M. Heard, a veterinary surgeon of repute, assserts that the *bacillus tuberculosis* of man is the same as that of bovines. He says that under artificial cultivation the bovine *bacillus* behaves the same as the human *bacillus tuberculosis*, and that cattle inoculated with the sputa of human tuberculous patients become tuberculous. The milk from tuberculous cows does not produce tuberculosis
less the udder is the seat of the disea
In that case, many instances show
danger of using the milk. An article
the October *Journal of Comparat*
Medicine and Surgery (where also M
Beard's paper may be found) urges
necessity of a sanitary inspection of
milk supply, with a view to eradicati
the danger, among others, of infecti
children and milk-drinkers with bovi
bacillus of *tuberculosis*.

ANTIQUITY OF MAN IN AMERIC

Von Koseritz has just published
series of Anthropological essays, bas
upon his investigations in Brazil. H
conclusions are, that the early Ame
can races were equally as ancient
the River Drift men of the old wor
and that they were not the same ty
as modern Brazillian nations.

IN *Science* for October 9, there is
extremely interesting paper on "Rac
Characteristics of Jews," illustrat
with portraits of five Jewish boys, a
a composite made from them. It
curious to note the apparent wide d
ference in the features of the seve
faces represented, and observe the
sult in the composite. This shows
noble and beautiful face with the ra
characteristics shaded, yet promine
It resembles faces from the sculptu
of Ninevah and Babylon.

SOME time since a startling pa
graph was current in the papers ab
a new telephone, invented by a Tex
of the name of Brown. It was sa
that his invention would revolution
telephony, and that he had sold an

terest to eastern capitalists for $1,000,000. It turns out, however, that the only patent thus far issued to the Texas genius, is for a new form of key, combined with the use of a Bell Telephone, in lieu of an ordinary telegraph sounder.

THE sixth volume of Dr. Brinton's Library of Aboriginal Literature is now in press. It is the annals of the Cakchiquels, and will be printed in the peculiar alphabet of the tongue. The annals were written about 1560, by a native of Guatamala.

A FLOATING dome was recently presented to the observatory at Nice. Instead of being mounted on rollers, this dome will rest on a reservoir of water. It is claimed that the suspension is so delicate that a single person can turn it round the horizon.

SAN FRANCISCO has good cause to discredit the wide-spread doctrine that wealth is inherently selfish and conservative. Already possessing one of the most remarkable libraries in the world, through the munificence of Mr. H. H. Bancroft, she will shortly boast another as the gift of another wealthy citizen, a Mr. Sutro.

SCIENTIFIC AND INDUSTRIAL NOTES.

A MATHEMATICAL THEORY OF EVOLUTION.

The following is the kernel of Mr. Cave Thomas' lecture on "The Bases of a Science of Æsthetics," which has not only an immediate bearing on the subject treated, but on the entire aspect of scientific thought. In reply to the question, "What were the bases of a science of æsthetics?" he said: "His audience were perhaps aware that philosophically it was a well-recognised fact that we know nothing of the external world absolutely per se, but only phenomenally, or as it appears to us in sense. We had, therefore, to ask ourselves whether there be any common and fundamental characteristic of those phenomena.

Speaking more immediately with reference to the sense of sight, the knowledge of external existence comes to us by means of the telegraphy of vibrations, which impresses miniature images on the retina. We never even "see things," as we express ourselves in their actual, but only in their relative proportions; and when we come to analyze the different kinds of impressions on the sense of sight, we find that they are manifested in the three fundamental modes of consciousness—viz:, in space, in time, and in force; and the important truth to be deduced from this, is that these three modes are alike quantifiable, that is to say, the terms more, less, equal, etc., were producible of the the three modes; differences in the sensations of light, colour, are therefore fundamentally quantitive, or proportional differences, differences in light and shade are also fundamentally quantitive, or proportional differences, and so also are differences in the configuration and superfices of visible images. It may be perceived, then, that the form of all visual phenomena, is quantitive. Hence the conclusion that all the relations of phenomena, recognized by the sense of sight, whether pleasing or displeasing, are fundamentally proportional relations and the science of æsthetics, a science of definite proportional relation—that is to say, the beautiful in form, in colour and in light and shades, consist in those definite proportional relations which are opposite to the sense of sight, to the eye, and these it is the aim of a science of æsthetics to formulate. The lecturer, however, has not limited his investigation to the sense of sight; he has analyzed the phenomena of the other senses, and has been led to make the following important generalization, which he believes will affect the whole future current of human thought, viz: that the form of phenomena, of experience, of knowledge, is quantitive. If this be a correct generalization, then adaptation to purpose, fitness, resolves itself into adaptation of proposition to purpose; evolution development, into the becoming of the proportioned in all things; politics into the proportional adjustment of material interests, and of social relations; ethics into the science of proportioned conduct; hygiene into the science of proportioned living; education into the science of training and developing a proportioned or beautiful race; æsthetics into the science of proportioned taste; and fine art into proportioned art. Mr. Thomas has completed a work treating all the above subjects fully on this mathematical basis.—Knowledge, June 5, 1885.

PHOSPHORESCENCE.

Near to my house there is an avenue of lime-trees, the growth of which is so luxuriant that the foliage almost shuts out the direct rays of light, and in this avenue, at half-past ten last night, I noticed a phenomenon that you may esteem worthy of chronicling.

The directlon of my walk was northerly, and I noticed that the leaves, and the air in their vicinity, were suffused with a soft, faint, phosphorescent light. This for a time I attributed to the vapour from the wet leaves being illuminated by the the moonlit clouds at my back, but, to settle my doubts, I examined a dense mass of tress from their shady shide, and found she light still distinctly visible, but, I think, not attributed to the moon. I believe some flowers are said to emit light. Are trees known to possess this power, and have the causes been unravelled ?—A. D. Barnes, in Knowledge, June 19, 1885.

A MODERN MOUND BUILDER.

I herewith send you the following description of a mound, opened by one of the Bureau Assistants on the Bluff back of Dunleith, Illinois.

This mound is conical in form, very symmetrical, sixty-five feet in diameter at the base, and ten feet high. It was found to contain a rectangular vault, thirteen feet long and seven feet wide, (inside measurement). The surrounding wall, three feet high and of uneven thickness, was rudely built of stone. Three feet from each end was a cross wall or partition of like character, thus forming a main central chamber about seven feet square, and a narrow chamber or cell at each end something over two feet wide and seven feet long.

The whole vault had been covered over with a layer of logs extending across the width of the vault, and their ends reaching slightly beyond the side walls.

In the central chamber were found eleven skeletons, six of them adults, and four children of different sizes, and one infant in the arms of one of the adults, probably its mother. They had all apparently, been interred at one time, and arranged in a circle in a squatting or sitting posture, against the walls.

In the centre of the space, around which they were grouped, was a fine large shell of Pyrula perversa, which had been converted into a drinking cup by removing the Columella. There were also numerous fragments of pottery.

The end cells, walled up as heretofore stated, were filled with a very fine chocolate colored dust, which gave out such a sickening odor when first uncovered, that the workmen were compelled to stop work until it had evaporated.

The covering was chiefly of oak logs, nearly all of which had been peeled, and some of the larger ones had been somewhat squared by slabbing off the sides, and the slabs and bark thus removed, together with the small brush, had been laid over them.

Over the whole vault, thus covered, had been spread layer after layer containing lime, each succeeding layer thicker and harder than that below it. Over this was a foot or more of soil.—Cyrus Thomas, in American Antiquarian.

THE FUEGIANS.

The average height of twenty men of the Tekeenika of Yaghan race, from Orange bay, was found by M. Hyades to be 1.576 meters, that of twenty females 1.478 meters, a difference of nearly ten centimeters in favor of men. The tallest man reached 1.660 meters, and the tallest woman 1.577 meters. Although the inhabitants of this district are few in number, the size of the families seems to show that they are not diminishing. The Yaghans of the Beagle river number some 800, and have for neighbors, at the extremity of Beagle strait, the race of the Ona, living in the mainland of Terra del Fuego. This race is friendly with the Tekeenika, but those who were seen fled the presence of the white man. The Ona are, says M. Hohn, as tall as, or taller than the Patagonians. Five entire bodies (preserved in alcohol) are in the collection brought to Paris by Romanche. These are publicly exhibited by casts, and a hundred casts taken from life, representing every part of the body of individuals of both sexes and all ages, are either exposed publicly, or retained as a special collection open only to naturalists and physicians. Numerous photographs taken from every point of view, some of them representing the natives engaged in the various occupations of their simple life, add value to the collection. Every female of two years of age and upwards wears the machakana, a small triangular piece of guanaco skin, fastened around the haunches with a plaited band of whale-bone fibers. Every Fuegian carries also a mantle, which is but a simple skin of otter, seal or guanaco, imperfectly serving as a protection from cold. Bracelets, necklaces of shell, etc., are also worn by the women; and the men often wear a band of feathers or down, usually of Bernicla anartica. The only cutting instrument of the Fuegians is a knife of the Mytilus shell fastened to a stone handle with shreds of sealskin. The fishing lines, made of the stems of macrocistis pyrifera, or of whale-bone fibers, end in a running knot furnished with a hook made from a feather. Fire is obtained by striking together two pieces of pyrites, and with the spark enkindling a mixture of the down of birds and fine scrapings from Berberis or Drimys. These scrapings are used also as sponges or napkins.—Amer. Nat., September, 1885.

USE OF SPINES IN CACTUSES.

Our brethren across the water, assuming that thorns are simply for protection in a military sense, are exercising themselves in their serials over the spiny leaves of the holly. When young and vigorous, i. e., in early life, the teeth are very spiny; when the tree is aged, and the branches then a distance above the surface of the ground, losing the vigor, the spines are weak or absent. Sir John Lubbock and others, following the poet Southey, see in this a beautiful adaptation for protective purposes. When within the reach of animals, spines are borne; when high up where animals cannot reach, spines are unnecessary. Numbers of species of plants have mucronate points to the leafy serrature, which are wanted in maturer years. It is at any rate difficult to imagine why a sharp point should be made especially for protection, and points less sharp for no protective use at all.

I have often reflected on a fact referred to by Dr. Newberry, that our thorniest plants are in much greater proportion in places where animal life is scarce, and the immense police force sustained by the great vegetable community absolutely thrown away. Cactuses and other thorny things I have seen covered with thorns and spines on deserts where the hot air seemed to be bounding up and down like the surging ocean, and where not even a lizard could have dared to show its face. Thorns cannot be, so I have thought, for protection where the climate gives all the protection desired. I am not one who doubts that nature has a purpose in every move she makes, but the main purposes I think we seldom reach, and that we do ourselves an injury in research by assuming mere incidental uses as the main purposes for which structures seem to be "adapted."

One of these uses in the spines of cactus has occurred to me. They break the full force of the sun on the plant, a force it is made to endure and not to love, as we know who have learned to cultivate it. Plant lovers set out their treasures in summer under "arbors" of fish netting or galvanized wire, and those who have no experience would be surprised to find how the moving shadows of the twine or wire lower the temperature. A mass of spines on a cactus must have the same effect. A cactus does not need much light on its epiderm to keep healthy. On the dry mesas along the Uncompahgre River I have seen some aggregated masses of Echinocactus phœniceus forming dense hemispheres a foot high and as much wide, with spines so thoroughly interlaced with spines as to rival the hedgehog, and leaving not a particle of the green surface visible; and there are species not cæspitose, such as E. pectinatus, which no one can see for spines without cutting apart, and forming a complete protection from the hot suns under which they are doomed to live.

I do not suppose I have yet reached the final purpose of spines in a cactus any more than we have the final purpose in the existence of the cactus itself, but that one use of cactus spines is to furnish a partial shade I feel to be beyond a doubt.—Thomas Meehan in Bull. Torrey Botanical Club.

WEATHER REPORT FOR OCTOBER.

Prof. Snow furnishes the following October weather report:

With one exception (1869) this was the coldest October on our eighteen years record. It was the fourth successive month with rainfall above the average. The cloudiness, wind velocity, and atmospheric pressure were all below the average. The first white frost of the season occurred on the 4th, three days later than the average date; and the first black frost followed on the 6th, thirteen days earlier than the average date.

MEAN TEMPERATURE—51.22°, which is 3.55° below the October mean. The hig est temperature was 77° on the 16th; th lowest was 29° on the 6th, giving a range o 48°. Mean temperature at 7 a. m., 43.39° at 2 p. m., 62.57°; at 9 p. m.; 49.45°.

RAINFALL—3.32 inches, which is 0.4 inches above the October mean. Rain fe on 7 days. There were 2 thunder shower The entire rainfall for the 10 months o 1885 now completed, has been 34.27 inche which is 2.69 inches above the average fo the same months in the preceding 17 year

MEAN CLOUDINESS—38.92 per cent of th sky, the month being 1.69 per cent. cleare than usual. Number of clear days (le than one-third cloudy) 16; half-clear (fro one to two-thirds cloudy) 8; cloudy (mo than two-thirds) 7. There were nine enti ly clear days and three entirely cloud Mean cloudiness at 7 a. m., 44.84 per cent at 2 p. m., 41.29 per cent.; at 9 p. m., 30. per cent.

WIND—N., 22 times; N. W., 17 times; S 14 times; S. W., 12 times; S. E., 10 time N. E., 9 times: W., 5 times; E., 4 time The total run of the wind was 9,350 mile which is 2,442 miles below the Octob mean. This gives a mean daily velocity 301.61 miles, and a mean hourly velocity 12.56 miles. The highest velocity was miles an hour, from the north, on the 28t

BAROMETER—Mean for the month, 29.0 inches; at 7 a. m., 29.108 inches; at 2 p. m 29.087 inches; at 9 p. m., 29.031 inches; ma imum, 29.416 inches, on the 8th; minimu 28 795 inches, on the 15th; monthly rang 0.621 inch.

RELATIVE HUMIDITY—Mean for t month, 70.1; at 7 a. m., 85.1; at 2 p. m 48.9; at 9 p. m., 76.3; greatest, 100, on 12 and 18th; least, 27, on the 3d. There we three fogs.

ST. LOUIS OBSERVATORY.

The new observatory at Washington U versity is about completed, and bids fair be one of the most perfect in the countr The earth upon which it is built at the co ner of Eighteenth and St. Charles streets, of a peculiar stiff clay, which allows ve slight transmission of vibration, and cons quently the observations will not be appreciably interrupted by the jarring of the building from external influences. Prof. Pritchet, who has charge of the astronomical department, is making preparations which, when completed, will insure a most instructive and interesting year's work. Through the generosity of a few public spirited citizens he has been enabled to contract for a new telescope and clock, which were much needed, and the character of which will place this institution among the first in the country. The object glass of the telescope is six and a half inches, and was made by Alvin Clark, of Cambridge, and the focal length is to be eleven feet. This instrument when complete will have sufficient power to discover a body as small as the custom house in this city on the surface of the moon, and with this Prof. Pritchet purposes to operate during the fall and winter in his exchange of signals with the observatory at the City of Mexico. It is also proposed to enter upon a course of observations to determine the truth or falsity of the nebular theory or system, which has become an interesting question of late, owing to the discovery of one first magnitude star and a smaller star in one of the heretofore unoccupied spaces. The cost of this telescope will be nearly $2,500.—St. Louis Globe Democrat.

EXPERIMENTS WITH A NEW EXPLOSIVE.

Experiments with nitro-glycerine and other explosives have just been concluded by the School of Gunnery at the new ranges at Lydd, England. They have been chiefly directed to ascertaining the effects of shell fire where the shells have been charged with high explosives. Some remarkable results have been achieved.—Tests have also been made with a highly explosive material manufactured by a German maker. The material is composed of two ingredients, one of which is nitric acid. This is placed separately in glass bottles, which are put into the shell. In this condition, they can be handled with impunity by the operators. The explosion is caused after the shell has been fired by means of a detonater, the two substances mixing when the bottles are broken by the concussion. The result of the explosion of these two substances is described as far more terrible than that of nitro-glycerine. During the experiments with nitro-glycerine, one of the howitzers burst, and the breech of the gun was completely shattered. The gun was fired by electricity, and those engaged in the operations were fortunately under cover.

IMMORTALITY OF UNICELLULAR ORGANISMS.

Professor A. Weismann (Biolog. Centralblatt., iv., pp. 577-591, and 650-655) believes that the idea of a senescence of unicellular animals is not tenable.

Physiologically speaking, there is a profound difference between the uni-and multicellular organisms in the fact that the latter only wear themselves out by living, and proceed to a natural death. The unicellular animals are never so modified by the transformation of matter that life becomes impossible. They have no physiological death; their bodies are immortal.

GRANO-METALLIC STONE.

Under this name, a new material for footpaths and roadways is in course of introduction. It is composed of certain proportions of blast-furnace slag and granite, which are crushed, chemically treated, dried, and mixed with Portland cement. For use, these ingredients are formed into a paste with an alkaline solution, and laid on a substratum of rough ballast, a smooth surface being imparted at the finish. This artificial stone is laid with facility and sets rapidly, being ready for passenger traffic in ordinary weather in about twelve hours. It is fire-proof as well as water-proof, and one of its important features is, that it is not slippery on the surface—a circumstance that is due to the particles of hard vitreous slag always presenting themselves just beyond the other ingredients, which yield more readily to wear. Judging from a sample length of this stone laid down in the

Strand in front of the Gayety Theater, it promises well as a cheap and durable paving. It is the invention of Mr. J. H. Bryant, No. 45 Palace Chambers, Westminister, London, and has been adopted by several of the leading railroad companies, besides which, contracts have been executed in some of the suburban parishes and provincial towns.

THE PHILOSOPHY OF FLAME.

In the study of furnaces, F. Siemens says that large ones must replace small ones. He claims to have proven that solid substances interfere with the formation of flame, and that flame injures solid substances with which it comes in contact. To account for the phenomena he advances, preferably, an electric hypothesis. Accordingly he explains flame as the result af an infinite number of exceedingly minute electrical flashes, the flashes being due to the very swift motion of gaseous particles, and a solid body which opposes itself to these flashes is cut by them, while the motion being more or less arrested by the solid body, the flame is dampened. Mr. Siemens insists, therefore, that flame must not be allowed to impinge on bodies to be heated, but must simply heat the bodies by radiation, and furnaces must be so constructed as to allow the flame to develop out of contact, not only with the substance on its bed but with the walls and roof of the furnace itself.

A REMARKABLE MAN.

According to the Cincinnati Enquirer there resides about four miles east Owingsville, Ky., a man who is indeed a prodigy. The name of this wonderful man is Reuben Fields, and he has but one developed faculty, this one seeming to take entire possession of him, driving all other thoughts from his mind. In early infancy he was apparently much as other children, but in extreme youth he developed a wonderful precocity, or rather a supernatural endowment for mathematics, even then solving difficult problems with apparent ease and with but little study. This became a mania with him, and grew as he grew, to the exclusion of all other branches or thought, until finally, without knowing a single figure or letter of the alphabet, he became the perfect master of the science of mathematics. He has been tested by the most scientific men of this profession, and the answers to the most difficult problems that they have been able to propound are at his fingers' end, the invariably correct solution being given in an instant, quicker than thought.

As an instance of his remarkable powers, he has been known to keep more than a dozen clerks busy in taking invoice of a stock of goods. Indeed, his knowledge and application of the science of mathematics far exceed anything that the most scientific men are able to comprehend. Another phenomenal characteristic of this man is that he can tell the time to a second, either day or night. Awakened from the soundest sleep he can tell you, without hesitation, precisely what time it is. What Blind Tom is to music, Reube Fields is to mathematics; and, like that illustrious idiot, this one branch absorbs his entire mental capacity.

Another peculiarity of Fields is his utter fearlessness of snakes. In his childhood he manifested a fondness for these reptiles and made them his playthings, and, strange to say, he was never bitten, though he handled with great carelessness and freedom the most poisonous species. He is very superstitious, and believes his extraordinary powers direct gifts from his Creator, and says that were he to reveal the secrets, or use them for the purpose of gaining more than the necessities of life, he would expect to be deprived of them immediately. He has more than once refused offers of handsome salaries. His parents died sometime ago, since which time Fields has been roving around among his kindred, staying with each a greater or less length of time, according to the nearness of kinship.

He is very fond of playing checkers, and it is said that he has never yet met his match at this game. He is annoyed a great deal by people who are curious to see his extraordinary powers exhibited, and he says that this is his greatest trouble, for whether he will or not, when a problem is presented the solution is bound to flash through his mind.

SAND DUNES.

The great sand dunes along the banks of many rivers, and particularly along the shores at the southern end of Lake Michigan, are due to the presence of the Ammophila Arenaria, or sand-gathering grass, which possesses a remarkable power of drawing up moisture. Indeed, it may almost be called a miniature water pump, for it is able to keep the earth wet for several inches around it. This wet earth catches and holds the drifting sand. The process goes on, the grass growing and the sand collecting, until a great sand dune is the result.

ORIGIN OF THE DIAMOND.

Perhaps it will be best to first state briefly two or three of the various theories which have been advanced:

1. Sir A. C. Ramsey, has urged that the real home of the diamond is in the schistose orgneissic rocks, of high antiquity, which are known to underlie the Kimberley shales, and which in other regions are even more directly associated with diamonds. From the broken and imperfect state in which the diamonds of South Africa are frequently found, it is certain that they cannot have been formed in the exact situation in which we now find them, while the fragments of gneiss which also occur in the mines prove that the diamond rock must have passed upward through the gneiss.

2. Professor H. G. Seeley, has suggested that carbonic acid found its way downward together with the water which (after its conversion into steam) has been shown to be the principal cause of volcanic eruptions. The carbonic acid was decomposed by heat, and then, under great pressure, the liberated atoms of carbon built up the crystalline form of that element known as the diamond.

3. Reasoning from the experiments of Mr. Hannay, it seems not impossible that the diamonds may have been derived from the carbonaceous matter contained in the shales through which the diamond rock passes. Not from those shales which form the walls of the present mines, but from shales occurring at a greater depth, and through which the intrusive bronzite has previously passed. If this be the case, it is clear that the supply of diamonds will cease when the shales have been worked through. In any case, the deepening of the mine will shed light upon the problem. Under the great pressure and high temperature to which the hydo-carbons in the shales would certainly be subjected at the time of the outbreak by which the existing pipes of volcanic rock near Kimberley were formed, the hydrogen of these hydro-carbons would be strongly attracted by the metal magnesium which now forms part of the bronzite. The carbon atoms—set free in this way—under the enormous pressure to which the whole mass would then be subjected, might aggregate together to form diamonds.

In any case, it is impossible not to agree with Professor N. S. Maskelyne when he says: "It is possible that carbon, like metallic arsenic, passes directly from the state of a solid into that of a vapour; and that the conditon for its sublimation in the form of crystals, or its cooling into the crystal diamond, is one involving a combination of high temperature, and high pressure present in the depths of the earth's crust, but very difficult to establish in a laboratory experiment."

Although, in the future, the geologist and the chemist must work together in the interesting task of discovering the mode of genesis of the diamond, yet it is clear that the onus of the direct proof must lie with the latter. In years to come, when the rocks of the diamontiferous regions shall have been mapped and studied as accurately and thoroughly as those of England have been, the geologist will probably be able to accurately locate the diamond in its true home—in the rock in which it was produced.

But as to the mode of its origin in that rock, the chemist will have much to say;

nor will the proof be considered complete until diamonds are produced artificially with certainty and ease. That they will be so produced the writer of this article considers certain, and if chemists had been able to command the expensive appliances necessary for the performance of the many and intricate preliminary experiments required —experiments which may involve years of failure - it is probable that success would have been attained ere now. When the Edison of chemistry arrives, artificial diamonds will be successfully made; they will perhaps, not be ornamental as those occurring naturally, but there is a wide field of usefulness awaiting such a product in the arts and manufactures.—Knowledge.

LAND BIRDS AT SEA.

The following story is credited by The New York Sun to a passenger on the steamship George W. Clyde from the West Indies:

"On last Monday evening the nearest land was the northeast end of the island of Abacoa, and this was 200 miles south-east by east. The Bermudas were 420 miles distant, and Turk's Island 440 miles. There was no wind at sea, and rain was falling heavily. Almost all of the passengers were assembled in the smoking room amidships. The room was small, and the door had been left open for ventilation. Suddenly a little bird fluttered in through the open door, darted against the lamp, and fell upon the floor. Another and another followed. Twittering was heard outside, and we found the decks covered with hundreds of winged creatures. They seemed to come from every side, attracted by the steamer's lights. In a few minutes, more than fifty had entered the smoking room, and bedraggled little wretches they were. Their long flights had used them up. We could take them up like so many blocks. We put all that entered the smoking-room under some hats and left them for the night. Outside their comrades perched on the rigging and covered the decks. Great numbers of them were killed by flying against the stateroom windows. Their little bodies were scattered
all about the ship. While we were att
ing to the birds in the smoking-room s
larger birds that had perched on the rig
were caught by officers of the ship. Am
them were two hawks. one of them of
smallest known variety, the Kestrel,
the other a common hen hawk. Hawks
generally shy, but so tired were these
that they allowed themselves to be cap
ed. The big one, however, made sav
fight, and drove his talons nearly thro
the palm of his captor's hand. We h
him for two days, but he would not eat,
finally he escaped."

"Besides the hawks, two water
were caught, and some birds that resem
our catbird, but they were larger and
brown wings. They were probably a
cies of jay. The small birds were a li
larger than a canary and of three variet
One kind was yellow, and another bro
and the smallest and most numerous w
gray, with very sharp beaks. In the m
ing we found a kingfisher perched in
rigging. He was rested, and we could
catch him. He would circle about the
a few times when started, and then ali
somewhere else on the ship. There w
little owl, too, that kept the kingfisher c
pany, but he soon disappeared. We
tended to keep some of the birds that w
caged in the smoking-room, but when
boy entered to clean out in the mornin
saw the hats there, and, gathering them
to his surprise a flock of birds sudde
fluttered about him, and then flew ou
the open door. They were very tame
perched all about the vessel. The office
the watch said they could hear birds fly
against the side lights of the ship and d
ping into the sea all night. It is evid
that there were thousands of birds fly
that night. We treated our visitors as
as possible, and gave them plenty to
but they did not seem to appreciate our
pitality, and by noon almost all of th
had left us.

"How to account for the appearance
these birds is a question. There were
on board who had traveled about the w
for forty years and never had heard of s

a phenomenon, much less seen it. There was no wind. For two days before and after the birds appeared you could have pulled a shell in safety on the ocean. Our theory is this: Abacoa, one of the Bahamas, is celebrated for birds. You may know of its proximity by the birds that fly about the ship. Now, the birds that came on board on Monday evening were Bahama birds, and they are found all about the island of Abacoa. We concluded that there was a local whirlwind, or tornado, that took up all the land birds of a certain district, and that afterwards, by an upper current of air, they were swept out to sea. There was no surface wind, or we should have felt it. The storm could not have been general, for the effect of wind at sea is felt often in the swell of the ocean, when there is no apparent air current. We get the swells of storms hundreds of miles away, but on this occasion there was no swell. So the tempest must have been local. Now, as there was no surface breeze, there must have been an upper current that swept the birds along after they were taken up, for it's a physical impossibility for many of the birds we found to fly 260 miles, the distance of the nearest land. I do not believe the small birds unaided could have done it. Any one who has hunted rail birds knows that that bird could not fly half the distance. The rail is a marsh bird. He loves to dabble in the mud along shore where the reeds and rank grasses offer cover. If he is hunted he takes to his legs and quickly hides himself. His wings are ill fitted for long flights, and he seldom rises. Now, two of these shore-loving rails ran against us 260 miles from land. Mother Carey's chickens are often found in mid-ocean, but they are peculiarly a water fowl. The birds we saw were all land birds—never found so far at sea, unless by accident. This theory is strengthened by the diversity in the birds. There were nine species; three varieties of small birds, two of hawks, an owl, a kingfisher, a sort of jay and the rails. You couldn't find a more heterogeneous lot.

"It seems plain that some force collected them and drove them to sea. We kept some of them in the boats until off the coasts, and then liberated them. There were two rails—a male and female. The male escaped a day out from New York, and the female was the bird that made off for Staten Island when we were in the Narrows. I do not believe that any of the small birds that left us in mid-ocean got to land. They had a night's rest, it is true, but they were desperately tired for all that, and had no wind to help them back."

THE AXOLOTI.

The transformations in case of the amphibia from the larval to the very different adult form have furnished common and interesting cases of metamorphosis, which all have witnessed. Perhaps the most curious representative of this group of animals is the axoloti, which inhabits the high plateaus of the Rocky Mountain region, from Montana to Mexico. The animal is ten or twelve inches long, fish like in form, but with four legs, a long tail like that of a salamander, and a tuft of gills on each side of the large, flatish head. Specimens were taken to Europe many years ago. At the Jardin des Plantes one of these animals left the water of the aquarium in which it was kept. It had lost its gills, but they were replaced by lungs. An experiment was then made on specimens kept by Freulin Marie von Chauvin. She removed them from the water, kept them in damp moss, and thus actually forced them to transform into the gilless, air-breathing state. They then somewhat resemble the large yellow spotted salamander (Amblystoma) so common in this region. Previously it was supposed that the larval, or gill-bearing stage was the permanent one, especially since in it they breed—lay eggs which hatch into similar forms, as is the case in permanently gill-bearing species. The adult is not so large as the larval form giving us as Packard has said, an epitome of what has happened in the life of this and other classes of animals. For the fossil forms were monsters, yet larval and premature as compared with their descendants. Extended experiments have been more recently made upon these animals by the same lady. She found that younger specimens could be more easily forced to transform than older specimens. If the water in which they are kept contains but little oxygen, so that they must come frequently to the surface for air, they transform more readily than if the water is thoroughly ærated. Freulien von Chauvin then tried the experiment of converting the axoloti back from the higher stage to the lower. In this she succeeded, or at least a vigorous larval animal fifteen months old, after being transformed to the adult stage (which required twelve days), and being kept out of water for another fifteen months, was brought back again to the water, to which element it accommodated itself in the course of six days. Here it lived three and one-half months. Then it was again forced to live on land, which it did six months—till the time of its death.

Some animals were kept in a state of suspended metamorphosis for three years; that is, when partially transformed, further change was prevented by low temperature and being placed at night in the water. Then some of these partially transformed specimens were forced to return to the larval stage (axoloti), and the others to the higher stage (amblystoma). It was believed for a long while that the axoloti in its native regions never transformed to the amblystoma stage; but it has been proved that, while many do not, certainly others do. The latest observations were published in Science last July. Dr. Shufeldt, located in the northwest part of New Mexico, has kept the animals in aquaria, studying their habits and propensities. He has also had opportunity to watch them wholly undisturbed in their native ponds. He corroborates the several statements made by Freulien von Chauvin. He finds also that they are very voracious animals, and that if fed abundantly with meat, the amblystoma, or adult animal, is much larger. The deeper the water in which they are placed, the less likely they are to transform; but in shallow ponds that have little or no vegetation, where the bottom is formed of hard clay, the larval form is longer retained, and the color of the animal, though usually quite dark, becomes, in this case, very light. During the past summer, Dr. Shufeldt saw the pond, where were multitudes of these animals, rapidly dry up. Those caught by the disappearance of the water in their quarter, disappeared in the mud, and, just beneath the surface, very quickly transformed to the lung-bearing stage, and left for adjacent woods. Others in deeper water remained undisturbed. If a rain came suddenly, refilling the dried pond, the further change of the half-transformed axolotis at once ceased, and they continued to live in the water as before. But subsequent drying would compel them to take on the adult, or amblystoma stage.—Prof. Kellerman, in Industrialist.

THE CARBONIFEROUS AGE.

An editorial in the Mining Review of Sept. 17, 1885, under the heading of "The Foundation," states that, "if our store of coal was all 'created' and laid away for future use there is no special advantage to be gained in endeavoring to ascertain the laws and causes most active in its formation."

It seems to me, as a representative of large tracts of mountain lands, that there are great advantages to be gained in ascertaining even the probable laws and causes most active in the formation of coal; and that it is of vital importance to know in what formations to look, and where to spend money for exploring, with a reasonable prospect of success; and in this connection it becomes a matter of practical interest, in dollars and cents, not only to the land owners, but to the whole community, to know at what period in the formation of the earth's crust the carboniferous age commenced.

According to the theory of the most popular geologist of the Nineteenth century, the carboniferous age did not commence until after the deposit of the sedimentary formation called the seral conglomerate of the Pottsville coal basin; being Formation No. XII of the Pennsylvania nomenclature, the carboniferous age being all included in Formation No. XIII, and they pronounce any man who looks for coal below that formation an imbecile, or worse.

Under this theory, the greater portion of the land in the world is laid under the ban of modern geologists.

Limestone, as well as coal, is classed by these same geologists as of organic origin, for the reason that some of these formations contain fossils, indicating animal and vegetable life; they assure us that the limestone Formation No II which, in some portions of the State of Pennsylvania, is said to be 6,600 feet thick, was deposited in the bottom of the ocean by the same animals which form the coral reefs along the coast; and yet we find this limestone underlaid by the sedimentary Formation No. I, called the Pottsdam sandstone, which is practically conglomerate rock.

We are assured by chemists that carbonate of lime contains about twelve per cent. of pure carbon, so that we should have nearly eight hundred feet in depth of pure carbon locked up in this Pennsylvania deposit of limestone Formation No. III. Admitting that it was formed of shell (which I do not), where did the shells obtain this vast quantity of carbon, if not from the ocean? And if from the ocean, it must have been in solution in the water as carbonic acid. If the carbonic acid and calcium, which form the carbonate of lime, were in solution i n the ocean, what was there to prevent their chemical combination in the water to form the limestone by direct action, and thus save the poor little coral makers millions of ages of toil?

Now let us suppose that there was a surplus of carbonic acid in the water after satisfying the cravings of the calcium and the formation of the vast beds of limestone. What next?

We find in the crust of the earth vast quantities of silica, and silicates of alumina. Now if these metallic bases, silicon and aluminium, were in solution in the acidulated water, they would readily combine with the oxygen of the carbonic acid, and come down as fire clay, and shales, to form a bed for the precipitate of carbon to fall upon, bringing down with it quantities of hydrocarbons to form the volatile portions of the coal.

If the water was badly agitated, this carbon would come down as a mixture with the mud, to form the slates above the limestone; but if in an inland sea where the waters were quiet, it would form layers of coal and shales.

The carbon to form the carbonic acid in the ocean, in all probability came from the interior of the earth, and was converted into carbonic acid gas by the same action and forces that cause earthquakes and volcanoes, and was injected into the ocean through the fissures below, under equal pressure. If this theory has the semblance of probability it is not unwise to look for coal in any portion of the earth's crust when the formations indicate the true coal series of conglomerate rock, limestone, fireclay, coal, shales; and the repitition of sandrocks, clays, coal and shales; so that an intelligent study of "the laws and causes most active in the formation of coal," is of no little value to the entire population of the world commercially.—Titus P. Emery, in Mining Review.

SCIENCE LEADS TO ECONOMY OF TIME AND LABOR.

How exultant is the old Greek poet Antipater ("Analecta Veterum Græcorum," Epig. 39, vol. ii., p. 119) when women are relieved of the drudgery of turning the grindstones for the daily supply of corn! "Women, you who have hitherto had to grind corn, let your arms rest for the future. It is no longer for you that the birds announce by their songs the dawn of the morning. Ceres has ordered the water nymphs to move the heavy millstones and perform your labor." Penelope had twelve slaves to grind corn for her small household. During the most prosperous time of Athens it was estimated that there were twenty slaves to each free citizen. Slaves are mere machines, and machines neither invent nor discover. The bondmen of the Jews, the helots of Sparta, the captive slaves of Rome, the serfs of Europe, and uneducated laborers of the present day, who are the slaves of ignorance, have added nothing to human progress. But as natural forces substitute and become cheaper than slave labor, liberty follows advancing civilization. Machines require educated superintendence. One shoe factory in Boston by its machines does the work of 30,000 shoemakers in Paris, who have still to go through the weary drudgery of mechanical labor. The steam power of the world, during the last twenty years, has risen from 11½ million to 29 million horse power, or 152 per cent.

Let me take a single example of how even a petty manufacture improved by the teachings of science affects the comforts and enlarges the resources of mankind. When I was a boy, the only way of obtaining a light was by the tinder box, with its quadruple materials, flint and steel, burnt rags or tinder, and a sulphur match. If everything went well, if the box could be found and the air was dry, a light could be obtained in two minutes, but very often the time occupied was much longer, and the process became a great trial to the serenity of temper. The consequence of this was that a fire or a burning lamp was kept alight through the day. Old Gerard, in his Herbal, tells us how certain fungi were used to carry fire from one part of the country to the other. The tinder box long held its position as a great discovery in the arts. The pyxidicula igniaria of the Romans appears to have been much the same implement, though a little ruder than the flint and steel which Philip the Good put into the collar of the Golden Fleece in 1429 as the representation of high knowledge in the progress of the arts. It continued to prevail till 1833, when phosphorus matches were introduced, though I have been amused to find that there are a few venerable ancients in London who still stick to the tinder box, and for whom a few shops keep a small supply. Phosphorus was no new discovery, for it had been obtained by an Arabian called Bechel in the eighth century. However, it was forgotten, and was rediscovered by Brandt, who made it out of very stinking materials in 1669.

Other discoveries had, however, to be made before it could be used for lucifer matches. The science of combustion was only developed on the discovery of oxygen a century later. Time had to elapse before chemical analysis showed the kind of bodies which could be added to phosphorus so as to make it ignite readily. So it was not till 1833 that matches became a partial success. Intolerably bad they then were, dangerously inflammable, horribly poisonous to the makers, and injurious to the lungs of the consumers. It required another discovery by Schrotter, in 1845, to change poisonous waxy into innocuous red-brick phosphorus, in order that these defects might be remedied, and to give us the safety match of the present day.

What have these successive discoveries in science done for the nation, in this single manufacture, by an economy of time? If before 1833 we had made the same demands for light that we now do, when we daily consume eight matches per head of the population, the tinder box could have supplied the demand, under the most favorable conditions, by an expenditure of one-quarter of an hour. The lucifer match supplies a light in 15 seconds on each occasion, or in 2 minutes for the whole day. Putting these differences into a year, the venerable ancient who still sticks to his tinder box would require to spend 90 hours yearly in the production of light, while the user of lucifer matches spends 12 hours; so that the latter has an economy of 70 hours yearly, or about 10 working days. Measured by cost of production at 1s. 6d. daily, the economy of time represented in money to our population is £26,000,000 annually. This is a curious instance of the manner in which science leads to economy of time and wealth even in a small manufacture.

In larger industries the economy of time and labor produced by the application of scientific discoveries is beyond all measurement. Thus the discovery of latent heat by Black led to the inventions of Watt, while that of the mechanical equivalent of heat by Joule has been the basis of the progressive improvements in the steam engine, which enable power to be obtained by a consumption of fuel less than one-fourth the amount used twenty years ago. It may be that the engines of Watt and Stephenson will yield in their turn to more economical motors; still they have already expanded the wealth, resources, and even the territories of England more than all the battles fought by her soldiers or all the treaties negotiated by her diplomatists. The coal which has hitherto been the chief source of power probably represents the product of five or six million years during which the sun shone upon the plants of the carboniferous period, and stored up its energy in this convenient form. But we are using this conserved force wastefully and prodigally; for, although horse power in steam engines has so largely increased since 1864, two men only now produce what three men did at that date. It is only three hundred years since we became a manufacturing country. According to Professor Dewar, in less than two hundred years more the coal of this country will be wholly exhausted, and in half that time will be difficult to procure. Our not very distant descendants will have to face the problem—What will be the condition of England without coal? The answer to that question depends upon the intellectual development of the nation at that time. The value of the intellectual factor of production is continually increasing, while the values of raw material and fuel are lessening factors. It may be that when the dreaded time of exhausted fuel has arrived, its importation from other coal fields, such as those of New South Wales, will be so easy and cheap that the increased technical education of our opperatives may largely overbalance the disadvantages of increased cost in fuel. But this supposes that future governments in England will have more enlightened views as to the value of science than past governments have possessed.

Industrial applications are but the overflowing of science welling over from the fullness of its measure. Few would ask now, as was constantly done a few years ago, "What is the use of an abstract discovery in science?" Faraday once answered this question by another, "What is the use of a baby?" Yet round that baby center all the hopes and sentiments of his parents, and even the interests of the State, which interferes in its upbringing so as to insure its being a capable citizen. The processes of mind which produce a discovery or an invention are rarely associated in the same person, for while the discoverer seeks to explain causes and the relations of phenomena, the inventor aims at producing new effects, or at least of obtaining them in a novel and efficient way. In this the inventor may sometimes succeed without much knowledge of science, though his labors are infinitely more productive when he understands the causes of the effects which he desires to produce.—Sir Lyon Playfair's Aberdeen Address.

MISCELLANY.

THE GORTYNA TABLES.

The learned world was startled last Summer, by the discovery of a great inscription at Hagioi Deka, the site of the ancient Gortyna, in Crete. The inscription was in boustrophedon, using the eighteen so-called Cadmean letters, and presenting so many orthographic and dialectic peculiarities that its difficulties prevented its appearing in the popular periodicals. The inscription was discovered by Dr. Frederico Halbherr, in July, 1884, in the bed of a mill stream. Dr. Ernest Fabricius succeeded in unearthing the whole inscription by the end of October, 1884, and found it to be on the inside of the enclosing wall of a presumably circular building, whose inner diameter was about thirty-three meters, the wall being about nine meters long, and about the height of a man. The inscribed wall consists of four courses of squared stones, of limestone. Dr. Halbherr subsequently found another loose fragment in the stream. The inscription, in its present state, consists of twelve columns, more or less perfect, and between fifty and sixty lines to the column. Other pieces turn out to have been previously found by other persons. The date of the inscription appears to be the fifth century before Christ. It was immediately seen that this inscription was a section of the famous Cretan laws; in all probability some of those which give more than heroic fame to Minos and Rhadamanthus. It was not possible to obtain squeezes; but Halbherr and Fabricius made careful copies, and attempts at decipherment immediately followed. The chief, and apparently the first works on the subject, were the following: Dareste, "La Loi de Gortyne," in Bulletin de Correspondence Hellenique, 1885, pp. 301—317; Heinrich Lewy. "Aites Stadtrecht von Gortyn auf Kreta." Berlin, 1885, Franz Bucheler und Ernst Zitelmann, "Das Recht von Gortyn," Khetnisches Museum Erganzungsheft XL; Domenico Comparetti. Leggi antiche della gita gi Gortina in Creta," Florence, 1885. Prof. A. S. Merriam also read a paper on the subject at the meeting of the American Philological Association in New Haven, last July. But the most self-commending publication thus far, is the very recent one of Johannes and Theodor Baunack, entitled "Die Inschrif von Gortyn," published by S. Hirzal, of Leipzig; an 8vo volume of 167 pages, with a fac simile plate. The decipherment, or rather, the solution of the orthographical, dialectric, and lexical puzzles, appears to be so far advanced that the inscription may be said to be read, and the laws to be fairly understood. The work of the Baunacks treats first of the alphabet, then gives the inscription in ordinary type, with the numberings of the original in capitals, with transcriber's variants in the lower margin. Then follows the grammatical matter deduced from the inscription, occupying the largest portion of the work; then the inscription divided into words accented and punctuated, with a translation in German, occupying 24 pages, then the lexical and exegetical matter, and a complete word-index. The contributions of the inscription to Greek lexicography and palæography are very great, and cannot be overvalued; but the matter of the law is of general interest, although they deal with many matters which Christianity has rendered well-nigh obsolete among civilized nations. The first section treats of lawsuits for the possession of an alleged slave. The alleged slave is not to be spirited away till the cause is decided, under a penalty to be paid by the litigant so doing. The law provides, in brief sentences, for the case when the alleged slave is proved to be free, when he is proved a slave and his posession is due to either litigant, and so on; and also for the various contingencies that may occur during trial. The second section provides for seduction, adultery, and the like; the third for division of the property in case of separation of man and wife, or the death of one of them; the fourth for the custody of children of separated wives or concubines; the fifth, provisions respecting the property of parents during life, and its disposition after their death; the sixth, of the limits of control over the property of members of the same family; the seventh, of certain peculiar cases in the law respecting slaves and children; the eighth, concerning the rights and duties of heiresses; the ninth, concerning sundry cases of suretyships; the tenth, concerning presents; the eleventh, of adoption, and its concomitants; the twelfth, supplementary matter to the preceeding. The provisions that relate to slaves, as might be supposed, breathe the spirit of all antiquity, which recognized nothing at all in the slave except the property of the master. With respect to separations of man and wife, since those are part of the institutions of almost all humanity outside of Christendom, there are a few lessons which might be taken to heart by those legislators who favor easy divorce. Thus:

"When man and wife are separated, she shall have, as her own property, that which she brought to her husband, and half of the increase, if any such has come from her own estate, and half of all that she has gained in the house [of her husband]; and five staters if the husband is to blame for the separation. But if the man alleges that he is not to blame for the separation, the judge shall decide between them, upon oath."

So again:

"If a separated woman comes back, the child shall be brought to his house in the presence of three witnesses. If he does not receive it, then the mother shall have power over the child, to rear it or to expose it; but the relatives shall first have a right to her oath and witnesses, whether she offered it [to her husband or not]."

In the case of a divorced female slave, who comes back with the child, the husband's master was to have the full decision; and that, also, even if she had re-married the same man within a year. If a separated wife should expose a child before complying with the foregoing provisions, then she had to pay a fine of fifty staters if the child were free, but twenty-five if a slave. In general, the laws show the spirit of equity, as nearly as we can perceive from our present knowledge of Cretan society. Today, of course, we are scarcely able to see the justice of compelling an heiress to marry her oldest male cousin, or if he is not willing, or if he is not grown up and she will not wait, lose a large portion of her heritage. However, an heiress was one who had no father or brother. She might also, in case the cousin would not or could not marry her for other reasons, marry whom she would and retain her whole inheritance. Adoptions might be made at pleasure, but it must be publicly done in the agora, before the assembly of citizens at the usual place of proclamation; but the one adopting a son had to give his "Hetaireia" material for a sacred offering, and a jar of wine. If an adopted son is the only child surviving the one who adopted him, he becomes full heir only on condition of performing all the religious and legal duties to his adoptive parent; but if he in turn died without leaving children, the property reverted to the relatives of the adoptive parent. The latter might, also, at any time, publicly annul the adoption by a proper proclamation and paying a fixed number of staters. An English translation of these laws, or better, an edition of the inscription edited and translated in English, is a work now much to be desired.—Exchange.

A SLAVE TO THE STARS.

An attempt is made to break the very eccentric will of Robert Treat Paine, a wealthy Bostonian who died last June. Mr. Paine was always regarded as a sort of crank during his life. For example, he paid over $1,000 in fines for stubbornly persisting in not clearing the snow off his sidewalk.

Regarding astronomical matters he was always thought to be half insane. When he died it was found by the terms of his will $50,000 was bequeathed to the president and fellows of Harvard college, or more if they deemed it necessary for the maintenance and support of a professorship at Harvard, to be called the professorship of practical astronomy, the holder of the same to be the director of the astronomical department. In commemoration of the great-grandfather, grandfather and father or the deceased, it is the wish of the testator that the professorship be called the Paine professorship.

All the residue of the property and estate is bequeathed to the president and fellows of Harvard for the support of the observatory, for the discovery of new comets, and planets, and for the purchase of medals for prizes for valuable essays written on astronomy, provided that the president and fellows pay monthly out of the fund $250 to the widow, Ann W. Paine, upon her written order.

The will was approved, but several appeals have been filed objecting to the decree of the probate court in allowing the will. The widow files an appeal in which she claims that her husband was not of sound mind when he made the will; that the witnesses did not sign it in the presence of the testator, or of each other; that undue influence was brought to bear on the mind of the testator, and that the instrument as made was afterward revoked. Elizabeth P. Patch and Charles W. and Henry M. Claggett, all of Boston, heirs at law of the deceased, have also taken appeals to the allowing of the will upon the ground that they are interested in the estate. The case when heard will be one of great interest, and some remarkable testimony regarding Mr. Paine's eccentricities will be given.

VISIT TO A SHOT TOWER.

Shot is formed by pouring a melted piece of alloy of lead through a colander or sieve at the top of a high tower. In falling to the base of the tower the particles of semi-fluid lead assume the globular form. They fall into a vessel of water placed to receive them, before reaching which they become so nearly solid that their globular form is retained when they strike the surface of the yielding element. An arsenical preparation forms the alloy, which makes the lead more ductile, softer and better fitted to take the spherical form. The soft and pure American lead requires less arsenic than the hard and brittle foreign varieties. Too much arsenic causes the drops to assume the lenticular form, and too little, causes them to elongate, to flatten on one side and hollow in the middle as they cool. The higher the tower the larger the shot that may be dropped in it. I had an opportunity at Chicago of inspecting the whole process of making shot. Also at the same time I saw how sheet lead and lead pipes are manufactured, and the no less interesting processes in the manufacture of linseed oil.

The lofty tower, as high and almost as massive as Bunker Hill monument, must have attracted the attention of nearly every one who has visited the city. From its summit the best view of the city is to be obtained. It is one of the tallest towers erected for this purpose in the world. There is one in Europe two hundred and forty feet high. Some of the perpendicular bluffs on the upper Mississippi, in the vicinity of the lead mines of Iowa and Wisconsin, are used in the place of towers, the melted lead being dropped over the precipices.

The shot are of larger dimensions than the holes of the colander through which they pass. Mr. Blatchford dipped out a handful from the cistern for our inspection. There were quite a variety of sizes, and many of the drops had assumed irregular forms. The first done with the shot is to dry them, and then the perfectly spherical ones are selected by a very ingenious contrivance, as simple as it is ingenious. A series of inclined planes is so arranged, one below another, with gaps between, that when the shot is poured upon the top one, the perfectly spherical ones of all sizes, bound forward merrily in straight lines, skipping the gaps unerringly, and flying off neither to the right hand nor left. Anyone who has tried to roll an imperfect ball in a tenpin alley, knows what an irresistible attraction the sides of the alley have for that poor ball. It will not keep upon the straight highway cast up for it, but must needs roll into the ditch, a melancholy instance of the "depravity of inanimate things." So the imperfect shot scatter out at the sides of these planes. And even if they chance, by a miracle of grace, to keep in the center, they drop into the cunning pitfalls over which their perfect brethren nimbly skip in safety. The nearly perfect ones sometimes escape several of these gaps, but are all caught before they reach the bottom, and, self-convicted, are unceremoniously returned to the melting pot. The perfect ones of all sizes run into a revolving barrel, where with a little pulverized graphite, or plumbago, they roll about for a while, and acquire the brilliant polish which is their finishing touch.

It only needs now to assort the sizes and to pack them in the little canvas bags familiar to all sportsmen. They are sorted in revolving cylinders slightly inclined, perforated with holes, which increase in size toward the lower end. Each size drops out as soon as it comes to a set of holes large enough to allow the shot to pass. The arrangement for weighing and bagging them is very ingenious. Receptacles numbered from one to twelve, according to the size of the shot, under the revolving cylinders, conduct the little death-dealing missiles through tunnels into the canvas bags. As soon as a bag has received its twenty-five pounds its weight shuts a valve, and no more can come till the bag is removed, and another one put into its place. One man tends the whole row, with needle and thread sewing up the bags, which are then ready for the market. All the work of the tower, except that which is done by machinery, is performed by three men.—Exchange.

SOME OLDEN TIME PECULIARITIES OF MEN'S DRESS.

There is no part of mens' costume which has not passed from one extreme of absurdity to another, and been most admired at its highest point. Coats have been worn with voluminous skirts dangling about the wearer's heels and with scanty lappels descending six inches below the waist. Coat-sleeves at one time fitted skin tight, and more than once have been so wide as to sweep the ground.

Flapped waistcoats, which in the time of George I, reached nearly to the stocking, were soon cut so short as to be nearer the armpits than the thigh. The tight fitting, closely-strapped trouser contrasts ludicrously enough with the trunk hose of the sixteenth century stuck out with five or six pounds of bran.

It is related that a fast man of that time on rising to conclude a visit of ceremony had the misfortune to damage his nether integuments by a protruding nail in his chair, so that by the time he gained the door the escape of bran was so rapid as to cause a collapse. It may have been that similar mishaps caused the substitution of wool or hair for bran, which afterwards became common.

Holmes, in his "Notes on Dress," says: "A law was made against such as did stuff their 'bryches' to make them stand out; whereas, when a certain prisoner (in these tymes) was accused for wearing such bryches contrary to law, he began to excuse himself of the offense, and endeavored by little and little to discharge himself of that which he did wear within them. He drew out a pair of sheets, two table-cloths, ten knapkins, four nightcaps and other things of use, saying, 'Your Lordship may understand that because I have no safer storehouse, these pockets do serve me for a roome to lay my goods in, and though it be a strait prison, yet it is a storehouse, big enough for them, for I have many things more, yet, of great value within them.' And so his discharge was accepted and well laughed at."

CURRENT LITERATURE.

Political Economy.

PRACTICAL ECONOMIES: A COLLECTION OF ESSAYS RESPECTING CERTAIN OF THE RECENT ECONOMIC EXPERIENCES OF THE UNITED STATES. By David A. Wells, LL. D., D. C. L., etc. New York and London: G. P. Putnam's Sons, The Knickerbocker Press, 1885.

This book is a compilation of papers from the pen of the distinguished author, which have appeared, from time to time, in various periodicals and newspapers. It would be supererogatory to enter into a discussion of Mr. Wells' ability and learning in respect to the subject matter of these papers, for he has long been an oracle to free-traders, monometallists and conservative economists. In fact his celebrity has been chiefly obtained as a publicist, and it would be impossible for any one to gain such a prestige without manifesting great merit and ability in his performances.

The papers comprised in the volume all touch on living questions in finance, commerce and social statics. And, while these subjects are discussed in a partizan spirit, and the errors of opposing schools exposed with great vigor, still the skill of the writer, his keen and trenchant logic and ready wit, keeps the reader interested in spite of antagonistic views.

Mr. Wells writes with the candor of conviction. No one can read the above volume without believing that his opinions, however erroneous or specious, are honest ones, and founded on experience in affairs and thorough acquaintance with the past and the present of the world's history. Those who wish to see both sides of the shield (and have only seen the silver side) should turn to Mr. Wells' book for aid.

Natural History.

THE STANDARD NATURAL HISTORY. Edited by John Sterling Kingley. Vol. V., Mammals. Illustrated. Boston: S. E. Cassino and Company, 1884. Kansas City: C. E. Hudson & Co.

This is Volume V. of a work of which Volumes I. and II. were noticed some time ago in the REVIEW. The intervening volumes (III. and IV.) have been delayed, we are told, by the binder, but will be forthcoming before Christmas.

The present volume comprises an account of the Mammalian family, and embodies the work of such specialists as Dr. Cones, Dr. Theo. Gill, J. S. Kingsley, W. N. Lockington, Samuel Lockwood, George Macloskie, Wm. B. Scott and R. R. Wright. It begins with a very useful and lucid introduction, which serves as a key by which the merest tyro can read what follows with pleasure and profit. The illustrations are new and excellent, being faithful representations of animal life. The "Standard Natural History" is destined to be the leading popular work on the subject of animated nature; and if the opinions of eminent scientists carry any weight, it is equally as useful to the student as to the general reader.

It is especially valuable to the young. Children and youths will read such a work with the avidity they would a novel, and the benefit they would derive from it cannot be compared to that derived from any other class of literature.

History.

HISTORY OF THE PACIFIC STATES OF NORTH AMERICA. By Hubert Howe Bancroft. Vol. XV., California. Vol. III., 1825–1840. San Francisco: A. L. Bancroft and Company, 1885.

Mr. H. H. Bancroft is performing a service for the Pacific coast unprecedented in former literary adventure. If the Atlantic States and the Mississippi Valley could have had their annals written in the full and generous method Mr. Bancroft has adopted, the results would have justified even the lavish expenditure and labor bestowed on the Pacific States History. It is true we have had a Schoolcraft, a Gallatin, a Parkman, an Irving, a George Bancroft, and many other eminent ethnological and historical writers: but their labors have not all been directed toward definite ends, and they have been too much hampered by the supposed necessity for balanced sentences and cadenced words. To tell the truth an artificial literary style is least needed in historical writings; for it always seems to be leading the attention from the facts and events narrated, to the ostentatious author.

The volume before us tells in good terse English, the story of an epoch as romantic and adventurous as any in history. In the two preceding volumes of Californian chronicles, the narrative of discovery and colonization has been brought down to 1825. Then commenced the stirring for independence which was to bring about civil war (not very sanguinary, however), between northern and southern California. The story of the skirmishes, the bickering, the diplomacy and intrigue characteristic of the time is well told This history has one source of great interest to old Californians. In each volume there is carried along an alphabetical pioneer register—giving a short biography of the immigrants who arrived in California from 1542 to 1848. This must have required an immense amount of labor in its compilation. No one can be said to be familiar with Californian history who has failed to read Bancroft's volumes.

Reference Books.

INDEXES TO THE ENCYCLOPÆDIA BRITANNICA, Ninth Edition. American Reprint. Philadelphia: J. M. Stoddart Co. Limited. 1884.

Those who have had occasion to consult the Encyclopædia Britannica can appreciate the value of an index which will direct him to the matter, and the matter alone, he wishes to refer to. While this great work stands unrivalled in its special field, there has always been a serious difficulty in the way of its popular use. In other similar works the arrangement of matter is more after the manner of a lexicon, and cross-references help the seeker after knowledge on his way; but in the Britannica, matter that might be distributed under fifty heads is put in under Astronomy, Botany, Geology, Mathematics, Palæontology or some such captions to the dismay of the hurried and the despair of the lazy. This Index furnishes just what is needed to overcome these difficulties. Upon an examination we find it thoroughly reliable and extremely useful.

Poetry.

UTOPIAN DREAMS AND LOTUS LEAVES. By George W. Warder. London: Sampson Low, Marston, Searle & Rivington. 1885.

It is the special mission of the REVIEW to encourage the growth of Literature in the West, and therefore it is with great pleasure it calls attention to the sheaf of poetry entitled above.

Mr. Warder has been so long considered the Bard of Kansas City, that we should feel quite startled to read Another's lyrical characterization of local or visiting celebrities.

In the volume before us there is quite a wide range of subjects to choose from; and it seems improbable that there could be any one entirely unsuited. He flies from "grave to gay from lively to severe," with the rapidity of thought and, like Puck, puts a girdle round the earth in "forty minutes," or thereabouts. So facile is our author, so unhampered by space, or time, or conventionalities, that he keeps his reader in a constant fever of anxiety as to his next flight. In this Mr. Warder can justly lay claim to great originality; for no one can deny that the introduction of a new principle into literary style is an achievement accomplished by but few, and when this principle is founded upon a characteristic of human nature so fleeting as the charm of uncertainty, it may easily be seen that genius, and genius alone, could have discovered and utilized it.

There it one fault we must find with Mr. Warder's poetry—it is a little fault and can easily be remedied. There is too much compresion, too much attention to the matter rather than the form. Mr. Warder is not a florid writer. Now and then, it is true, he forgets reserve, flings prudence to the winds, mounts the most skittish Pegasus that can be captured in all Castalia, and, riding amuck at the startled moon, scatters flowers, jewels, diadems, over the hushed universe. But these moments of poetic fervor are all too rare; his sober muse is rarely "Empress of the raging storm."

Without wishing to be hypercritical, there is one other fault to be found with our Bard. Occasionally he slyly indulges an ironical mood, which is most unexpected in the Minstrel of Eden Dell. It was Byron, I think, that contemned blank verse as "prose run mad." Mr. Warder has seen fit to adopt the same view, apparently, and in a humorous moment has travestied that form of poetry in a piece entitled "What Causes Poetry." This opens as follows:

"This causes poetry. 'Tis the first effort of the
Mind to soar into fair fields of glowing fancy;
To lift itself into high channels of bright thought;
To perceptions lofty and enthusiastic of the
Grand and beautiful, to struggle up to
Greater light, to something better and more noble
Than the groveling and material things
That make the routine of each passing hour."

In the words of Mr. Pecksniff, "it was not well" in Mr. Warder to thus rudely travesty a form of verse so sublimely used by Milton, so exquisitely refined by Tennyson.

The frontispiece does scant justice to Mr. Warder's face. We assure the stranger fair ones who read his book (and we hope they will be legion) that he is a much handsomer man than the graver makes him to be.

Other Publications.

Natural Gas; Its Advantages, Use, Supply and Economies. By George H. Thurston. Pittsburgh: A. A. Anderson & Son, 1885; pp. 31.

Bullettin of the Washburn College Laboratory of Natural History. Francis W. Cragin. Topeka: R. E. Martin & Co. 1885. Price 20 cents.

Le Taensa a t' il ete Forge de Tontes Pieces? Response a M. Daniel G. Brinton, A. M., M. D. Par Lucien Adam. Paris: Maisoneuve Freres et Ch. LeClerc. 1885.

Dom Parisot, ne Produira pas le Manuscrit Taensa. Lettre a M. Victor Henry. Paris: Maisoneuve Freres et Ch. LeClerc. 1885.

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THE KANSAS CITY REVIEW.

DECEMBER, 1885.

WARREN WATSON, - EDITOR.

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THE THEORY AND DEVELOPMENT OF ELECTRO-MAGNETISM.

This article is not intended as a technical essay on the subject treated, but rather as an attempt to give some simple explanations of what is generally considered a mysterious force, and a concise history of its development.

Galeazza, in honor of whom the first electric car operated in the West is named, was the family name of the wife of Galvani. To her the credit is given for first bringing to notice the fundamental principles of Electro-Magnetism.

In 1831, Prof. Faraday discovered that by moving a wire to or from a magnet, a current of electricity appeared, or was induced, in the wire.

What Electricity is, we do not know. A wire through which a current is traveling is nowise altered in appearance, yet its presence can be easily demonstrated.

According to the modern theories, Electricity, like heat and light, is a form of motion, and is convertible into other natural forces at will. Thus, heat produces electricity; electricity magnetism; magnetism force, and force, heat.

The creation of Static Electricity by friction dates back too far to trace, and has never been of any particular advantage in the arts. Franklin, in his well known experiment of the kite and thunder-cloud, first proved lightning to be identical with it.

Volta's pile, was, however, probably the first arrangement, or battery, ever constructed, which was capable of giving out a constant, steady current of electricity. His discovery of this principle seems to have been, like so many other discoveries which have been of the greatest importance to the world, the result of an accident. Having placed a small piece of copper on his tongue and a piece of zinc under it, Volta noticed a peculiar metallic taste when the edges of the metals came in contact, and its absence when they were separated. Quick to take advantage of every idea which suggested itself to him in the line of investigations he was pursuing, he constructed his so called "pile," composed of alternate layers of zinc, damp cloth, and copper, and thus was brought forth the first electric battery—since known as Volta's Pile; here was the first constant source of electricity.

The Galeazzi story runs something like this: "One day, Galvani, her husband, was experimenting with a voltaic pile. She noticed that when the wires leading therefrom approached some frog's legs which she was preparing for dinner, a peculiar spasmodic muscular movement occurred, causing a twitching or jerking movement of the same, and thereupon she called the attention of her husband to this seemingly strange phenomenon.

A closer observation of this fact and additional experiments, indicated to Galvani that the Magnetic forces with which the wire was endowed did not reside in the wire itself, but in the space surrounding it.

Acting upon this reasoning, Prof. Joseph Henry, of the Smithsonian Institute, in 1831, constructed the first horse-shoe magnet, which made telegraphy, telephony, and in fact, all of the arts in which Electro-Magnetism is now used, possible. Like Faraday, he displayed the true spirit of the scientist, and was more anxious to discover new facts in Magnetism than to exalt the value of those obtained, "being assured that the latter would find their development hereafter." Thus were important discoveries given to the world, to be afterwards developed into ideas and inventions, which have revolutionized the arts and sciences, as well as the commerce of the world.

In tracing the development of Dynamic Electricity we begin with Faraday. Up to the date of his discoveries, two other means of producing electricity had been known, viz: friction, and the decomposition of metals. But while these methods were available for the generation of light currents such as those required in the transmission of signals, they were altogether too expensive for the production of heavy forces. A voltaic battery that generates electric currents by dissolving zinc with sulphuric acid is an expensive source of power indeed; the zinc (the fuel of the battery) costing more than twenty times as much as coal, and, at the same time only evolving about one-sixth as much heat; leaving out of consideration altogether the expense of the acid.

In 1831, Prof. Henry developed and described the first Electro-Magnetic Motor. This was subsequently modified by different inventors and numerous attempts were made to propel boats and cars by this means, but such attempts all failed financially.

Had Faraday's discovery been developed as promptly as Henry's, the world, to-day, would have known much less of steam locomotion. It slumbered, however, for nearly thirty years; when the subject received a new impetus by the inventions of Pacinnotte and Gramme.

In 1860, Dr. Pacinnotte described in an Italian journal the first dynamo-electric machine; *i e*, a lot of bundles of wire revolving before the face of magnets, with suitable connections. This machine, planned in accordance with the principles laid down by Faraday, when put in motion by an external force induced a powerful current of electricity. The most remarkable feature, however, of this machine was plainly pointed out by its inventor. He found that it was reversible; that is that by applying power to it it produced electricity, or by applying electricity it produced motion or power.

Strange to say this most important discovery passed unnoticed for ten years, when Gramme, of France, re-invented the same apparatus. All practical dynamo electric machines and motors of to-day, are but modifications of the Gramme machine.

These discoveries, as I have said, at once gave a great impetus to the investigation of electric locomotion and lighting. The problem of cheap production of powerful currents of electricity was felt to be nearly solved. Subsequent improvements and modifications rendered this belief a certainty. Suddenly, and on all sides, there was the greatest activity shown in applying and adapting this new force, (new, because for the first time, practical) to the various necessities of civilization. From an expensive and experimental toy, the electric light sprang at once into common and practical use. So cheaply can currents be produced and converted into light that it is now said by excellent authority that 90 per cent. of the energy of the steam engine can be returned into light, by means of the perfect dynamo machines now constructed; a result which would have been hailed with absolute incredulity by the scientists of less than forty years ago. So much has electrical science advanced. Indeed, it is claimed by some of the motor makers that their machines give a proportionate return.

Electrical engineers have done their work much better than steam engineers, but much yet remains to be accomplished. When, in the future, another Faraday unlocks the hidden mysteries of nature and unfolds to us a method whereby the energy stored in fuel may be changed direct to electricity, then, and not until then, will the age of steam pass away.

The laws governing electricity are as well known and immutable as those of gravitation. We know that it falls to the earth on the line of the least resistance, and that it can be confined in conductors which offer less resistance than the adjacent elements. In winding Dynamos with coarse wire we get a current large in volume, which requires large conductors, but low in intensity; on the contrary, in winding them with small wires small quantity, with great tension (or power of overcoming resistance) is obtained. The former is such as is used in Incandescent Electric Lighting, and is considered harmless. The latter, which is the current used in Arc Lighting (the system in use in this city) is of a more volatile nature and is highly dangerous.

The writer does not know where the dividing line between Static and Low Tension Currents of Electricity. lies. Frictional machines have been made large enough to discharge a spark through the air to a point eighteen inches distant.

The development of Dynamo Machines has necessitated the adoption of standard rules of measurement. A volt meter indicates the tension of a current, whilst the quantity is measured by the ampere meter. A convenient rule for finding the mechanical horse-power of a current is to multiply the number of Volts and Amperes together, and divide by 746.

What constitutes a safe current is hard to determine. A thin-skinned, moist-handed person would be killed by handling wires carrying a current of one thousand volts, while a dry, horny-handed person would not notice the same contact.

Although I have spoken of electricity as being generated from steam power, yet water power is a good equivalent. From a calculation which I some time ago made, I became convinced that the force quietly going to waste in the Kaw River is sufficient to move all the railroad trains in the states of Kansas and Colorado.

This reminds me that I was to add something concerning Electric Railroads, and more particularly concerning my developments ot the system substituting electric motors for animals. Animal power, compared with steam power is very expensive, and compared with the power derived from electric motors is still more so. It is a fact well known to engineers that the best locomotives, in point of economy, are very imperfect and wasteful machines, and it is necessary that they should be such. They must use a large percentage of their energy in auxillary devices. They are compelled to use force-blast, which is a fuel wasting affair. They cannot avoid leaving a track of heat and carbon as they pass through the country. The best locomotives built consume seven pounds of coal to the horse-power developed per hour (many use 15 pounds) while stationary engines are getting common which use less than two pounds. In my system of Electric Railroads stationary engines are used to run a dynamo-electric machine, whose current travels on conductors placed above and near the track. A traveling carriage connected by a wire with the motor on the car, rides on this conductor which is over the track, and is pulled along by the motion of the car. Thus we get a constant current transmitted to the motor on the car itself, which is exactly similar to the one at the engine house which generates the current. By remembering the description of Dr. Pacinotte's discovery of the reversibility of the dynamo, the reader can readily see that the electric current generated by the dynamo at the engine house, will turn the motor on the car at a high speed. The rest is simple. To connect the motor with the car axles, so as to transmit the force to them, is a question of every day mechanics, with a description of which it is not worth while to trouble the reader. But this is not all. When the car is forced down hill by gravity, the arrangement is such that the momentum of the car turns the motor on board of the same, and causes it, in turn, to produce a current of electricity which is utilized to assist other cars up the grades. Thus as littls as possible of the energy is wasted, and, in fact, I believe that our system returns more of the energy into motion than any other. This is but saying, in effect, that it is cheaper than any other means of street locomotion. This we have demonstrated. The results of our experiments, carried on during the past twelve months, are very satisfactory, and there can no longer be any doubt that, in a very short time, electricity will take the place of animals and cables in propelling street and elevated cars.

ATMOSPHERIC TIDES.

As the month of October is, for many reasons, a typical one, it may not be without interest to examine, somewhat in detail, the phenomena which the United States weather maps so graphically picture forth.

The theories in regard to areas of low and high barometer and their tracks are continually undergoing modification. They are very different from what they were five years ago. They have materially changed within two years. In early days a systematic charting of each separate "low" was undertaken. It was believed that by such minute observations a definite track could be determined. This has been productive of excellent results. Beyond such empirical success lies, however, a region of true scientific deduction. That has yet hardly been approached.

The weather map includes the portion of North America lying between the meridians of 20 east of Washington to 50 west and the parallels of latitude 20 to 50. Roughly it is about 3,000 miles east and west by 1,800 north and south. It is too limited for a proper representation of our weather system, but it is even now beyond the limits of the means at the disposal of the signal office to adequately fill out with stations.

The earth at the northern line of this map has a much sharper curve than at the southern line. We may compare it to the shape of a jug towards the neck. We may suppose the tendency of the line of low barometer towards the northeast as exemplifying the same law which would make a string slip towards the neck of a jug if drawn around it and tightened.

Meteorology is easily divisible into climatology and the "law of storm." To the former, tables of mean pressure, temperature, wind direction, rainfall, etc., belong. They are valuable even as tables of life, statistics of production and the like are for special professions. The "law of storms" deals with the atmosphere as a whole or over some portion of the globe of considerable extent; in the present case, the region in and about the United States, as before indicated.

On the first day of October of this year there was upon the weather map a roundish space of about 800 miles in diameter near the upper left hand corner, or northwest quarter, marked "high" and quoted as showing a pressure of 30.20 inches. About a thousand miles to the southeast, somewhere near the Ohio valley, was a smaller but irregular oval, some 700 by 100 miles in area, the longest diameter lying in the same direction, viz: southeast and northwest. It was marked "low," with a pressure of 29.80. It may be unnecessary to state that a difference of four-tenths of an inch in pressure between areas so far apart is not likely to produce any serious disturbance. The actual difference in tons can be easily enough calculated, difference in area also considered, but divided by a thousand miles it would not give a high ratio of local pressure.

From what we know by previous observations, we can formulate a few general laws by which the progress of this area of low barometer may be foretold. Usually the direction is northeasterly, at first of moderate and then of accelerated speed. Cloudy weather will usually be its accompaniment, with possible rain along a certain line. This, over a certain district, with east to southerly winds upon one side, and north to northwest on the other. Warmer followed by cooler temperature, as in the stereotyped formula. To do more than this, we must enter into a region of speculation, and theorize a little boldly. The defect of our weather map is that it covers too limited a field. Looking at the map and seeing the relative positions of the two areas charted, and their direction from each other, we might guess that, as when there is a valley at the foot of one hill another hill is on the other side, so an area of "low" implies areas of "high" upon both sides. Since the "low" is a thousand miles, southeast of the "high" in this case, we may conclude that southeast of this a thousand miles or so is the opposing high. It might be farther or less, since the gradient is frequently steeper on one side than the other (and this is an excellent means of calculating the probable direction), but that it exists is almost self-evident. We may satisfy ourselves that it is there in this case by glancing two or three days ahead, say to October 4th, when a well-defined area of high is charted off the Carolina coast. It is almost too well defined upon its seaward side, since no reports could have come from there, but that is a minor inaccuracy.

We wish then to insist upon the fact that this area of "low" lies between two antagonistic areas of "high" that probably the southern area is the largest, that it "outflanks" the northern, so to speak, and that the "jug-neck" shape of the earth conduces to the constantly slipping northeasterly of the low barometer track.

On Oct. 2d, the area of "low" had moved a little to the north and was not very well defined, but began to get squeezed into more marked existence on Oct. 3d, then over the lower lakes with a pressure of 29.60. On the 4th, it was 29 40, its area very much circumscribed and by the 5th, is off our maps at the upper right hand corner. Evidently like the vortexes we see formed in running water there is a tendency to increase of local depth with limits of area. If we go back to the last week in September we can trace this area from the Gulf of Mexico, gradually increasing in definiteness and going off in a swirl like a snapper of a whip.

On October 6th, an area of "high" was near the center of our maps; 30.10 was the pressure. It was of enormous extent, shading off gradually upon all sides. Cool and clear weather generally prevailed. Now the problem is, where is the next "low" to come from? The answer to which is, "upon which side will another area of "high" encroach?"

From the 6th to the 9th, this question remained unanswered. There was but slight change. Then an area of "low" appears in the extreme northwest and another in the southeast. The first developes the most rapidly,—the "jug-neck" again, less distance to travel, line of least resistance, fewer opposing forces,—but vanishes out our of sight north of Lake Superior on the 12th. The "low" to the southeast moves inland, and then during the 12th, 13th and 14th takes its usual northeast course, and so off the map.

Again on the 15th an area of high barometer prevails over the United States, which breaks up slightly during the 16th, 17th and 18th, and partially developed areas of less pressure show here and there, and move northeast.

On the 18th, a well-marked area of low barometer (lying northeast and southwest, oval shaped, 90 by 300 miles, with a pressure of 29.70) is near the center of our map. We conclude that this indicates antagonistic areas of "high" to the northwest and southeast of it; and on the 19th these appear, the low scudding before it, or seeming to do so, while the high augments in volume, as a rock seems to grow into an island as the ocean ebbs from around it. Oct. 21st to 24th, appears to be devoid of eccentricities. On the 27th, with an area of "high" in the middle of the northwest quarter of our map and another upon the Atlantic coast, there reposes between them a lower pressure over the lake region.

From the 28th to the 31st, an area of low barometer passes from Alabama to New England.

There is not space to more than outline some general modern meteorological generalizations. The distance between areas of high barometers is not over 3,000 miles. As they approach nearer than this the definition of the "low" is more and more marked. They seem to lie over this continent, to each other northwest to southeast; at least the southern area seems to encroach so as to out-flank the northern one to the east.

The direction of the wind at the surface is a matter of minor importance. It does not determine scarcely anything. When the tide is passing through a channel filled with rocks, especially from many points of entry, there will be many conflicting currents. Suppose the aerial sea that surrounds this globe has its billowy upheavals like the ocean? We have proved a polar atmospheric ocean and one at latitude 32, both of superior pressure to that which lies between them. Would there not be found at its line of meeting and commingling, a series of atmospheric vortices which would mark their presence by barometic fluctuations? The southern sea being the larger would give the resultant line of direction. As these vortices moved along this line over areas of low pressure, storm centers would result.

Thus the final explanation of these low barometers will, I think, be found to reside in the theory of atmospheric tides." As birds fly by the variation produced on a single direct motion by the center of their wings, so all the variations in low barometer tracts can be referred to the interaction of waves sent off from the polar and southern air seas. Naturally the transient phenomena is the first to be observed, its measurement attempted, its relative frequency commented upon. Fire was once esteemed a primary element and today it is easier to measure the flame of a burning gasjet than to calculate in advance what the figure will be from an unlighted aperture. A local disease receives treatment in many instances locally, and not as an exhibition of some fault of the system as a whole.

The daily atmospheric tide occurs with great regularity, being high at about 10 o'clock morning and night, and low about four. It does not seem to lay as does the grosser fluid of the ocean, nor give rise to supposed coincidence in its movements with the rising of the moon. That it is the sun and not the moon which rules the oceans' currents, is at present understood.

This daily tide being admitted we can advance a little farther and say that as at the poles and south of latitude 32, there is known to be a greater density of the atmosphere than intermediately, the daily tide will then have a tendency to accumulate and flow over this intermediate space from both sides but with the stronger power from the southern sea. This "overthrow" or wave will occur about once in three or four days, and would be regular in its action were the conditions causing it, regular, but these conditions not being invariable (notably the inclination of the ecliptic), the line of the interference of the waves of the polar and southern areas will vary continually. There will be a certain periodicity taking one year with another, or, eliminating accidental influences, by comparing a number of years, but the reciprocal conditions will scarcely ever be found. Sometimes the polar "off-throw" will be stronger than usual, and the meeting line will be pushed farther south, and again the northern area will encroach very far upon its northern rival. But if we take the average conditions and show that at certain intervals, the vortex of meeting will be in the northwest, and at other times in the Gulf of Mexico, even with this as a general condition we have made a great advance towards a scientific explanation of the phenomena.

It is probable that the mechanical influences will prove more effective than the dynamical in most atmospheric phenomena. It will be cold with a wind of several days continuance from the north, and warm with the wind from the south, because the air will bring this temperature with it, and seldom from influences due to evaporation, condensation and similar dynamic results of the inter-mingling of air of different temperatures.

But the mathematical formula for thorough elucidation of weather conditions will not be an easy one, nor will it be one that an untrained intellect can successfully complete. In a popular magazine a general idea of atmospheric conditions can be explained sufficiently clearly. But scientifically the problem is only pushed back a little and removed into the hands of a few skilled students of Natural Philosophy.

SHAKESPEARE'S CHILDHOOD.

In the early part of the sixteenth century, there lived upon an estate of Robert Arden, at Snitterfield, in Warwickshire, a tenant farmer whose name was Richard Shakespeare. This farmer had two sons who had received at the baptismal font, the names of John and Henry. Of these, the former seems to have possessed an adventurous disposition; and finding the monotonous life of a farmer too sober for his aspirations, turned his back upon the rural solitudes of Snitterfield, and sought a more congenial career in the parish town of Stratford-on-Avon. His brother Henry remained at home,—content to assist his father's labors during his life-time, and at his death succeed him as tenant of Robert Arden's fertile acres. The impulse that moved John Shakespeare to settle at Stratford was, unquestionably, the same motive which has always impelled unquiet and ambitious minds to uncover their talents to a wider audience than destiny provided them at their birth. "To be of worth and worthy estimation" is the lode-star of such minds; and the contemptuous neglect, or grudging praise, of rustic familiars, forces them into the great world in search of a suitable atmosphere to mature "the blossoms of their fortune." Upon every highway that leads to populous haunts of men the footprints of ambition point townwards; and thither its votaries must go to seek applause for wisdom, wealth, or honor. Allured from obscurity by such aspirations, young Shakespeare found himself, in 1552 an humble tradesman at Stratford, prospering in the accumulation of wealth and rising in the estimation of his townsmen. With the land-hunger so common to those just emancipated from tilling the soil of others, he devoted his first savings to the purchase of real estate—two tenements in Stratford; in one of which was to happen an event more important to England than the birth of a prince or the gaining of a battle. At this time he was a bachelor, and if the antique records of the corporation may be credited, his housekeeping was no more cleanly than that of modern animals of the same species. He was fined, in April, 1552, the sum of twelve-pence for throwing slops in the streets. This was a hint in favor of matrimony that may have induced him to think seriously of a matter which young men are prone to put off, with the call for repentance, till a more convenient season. For some reason, however, his reflections bore no immediate matrimonial fruit, and five years were suffered to pass by before bachelor John exchanged his dirty and cheerless lodging for the domestic comforts of "Benedick the married man."

Robert Arden, of Wilmecote, the landlord of John Shakespeare's father, was a considerable figure in Warwickshire. He owned estates at Wilmecote and Snitterfield and, at his death, his personal property was appraised at nearly seventy-eight pounds—a sum which, at this time, would be equivalent to about four thousand, five hundred dollars. In those days of small fortunes the lucky possessor of such means was placed in a position of great provincial influence and respectability. Indeed claims have been advanced by various writers that the Ardens were of gentle lineage and connections. It is said that, in times past, the family had shone at court; and that John Arden, Henry the Seventh's Esquire for the Bath, was a relative of the Warwickshire Ardens. Besides there has been found, amongst the Archives of the College of Arms, a manuscript which speaks of the "ancient cote of arms heretofore assigned to" Robert Arden of "Wellingcote" in Warwickshire. But there is no proof that such a blazon even existed and we must be content to look upon him as a yeoman farmer, enriched by industry and thrift and entitled by grace of nature, not heraldry, to "golden opinions from all sorts of people." By his first wife, whose maiden name has not been preserved, Arden was the father of seven daughters, five of whom survived him. Shortly after the birth of her youngest daughter, Mary, poor Mrs. Arden having completed her earthly destiny, "made a groan of her last breath" and left her good man a widower. The lusty old gentleman soon grew tired of celibacy, and, looking about for a helpmeet, fell into the toils of widow Agnes Hill, nee Webb, who very easily gratified her ambition to become the partner of his bed. This occurred sometime during the year 1550,—the period when John Shakespeare left Snitterfield for Stratford. At this time three of Arden's daughters were married. Agnes, having first been married to John Hewyns, was left a widow, but readily secured a second husband in Thomas Stringer, of Bereley; Joan had married Edward Lambert of Barton-on-the-Heath, and Catherine was the wife of Thomas Etkyns of Wilmecote. Alice and Mary remained unmarried and kept house for their father till the advent of their step-mother; then no doubt, the new mistress of the manse took possession of the keys which had dangled from the trim waists of Alice and Mary and criticized severely the domestic arrangements of the young housekeepers. How, or when, or whether, Alice was relieved from the dominion of her step-mother does not appear, but we find her at the death of her father seven years afterward, still unmarried as well as her younger sister Mary. As for Mary, it is opined that a certain young tradesman of Stratford, had grown to be a familiar figure at Wilmecote on holidays and summer evenings, and that the gossips of the neighborhood were quite scandalized at the possibility of pretty little Mary Arden marrying the son of her father's tenant. It is not likely that the old gentleman himself was pleased at the prospect; at any rate the lovers were not "conjoined in the state of honorable marriage" till after his death.

This event occurred sometime in the year 1557. Bequeathing his "solle to Almyghtye God and to our Bleside Ladye, Saint Marye, and to all the Holye Companye of Hevin," and his "lande in Wilmecote, cawlide Asbyes" to his daughter Mary and remembering his other children and his wife in less substantial bequests, the prosperous yeoman took his place among the generations who have "trod the way to dusty death." His testament leaves us in no doubt about Mary's place in the estimation of her father. She was still his youngest child; for the second Mrs. Arden had presented him with no competitor to snatch from Mary's brows the crown of love that falls upon the latest born. Yet, despite her youth, she must have shown mental qualities of a superior order; for the shrewd old man appointed her, together with her maiden sister Alice, "ecxequtores" of his will, to the exclusion of their eldest sister and their indignant stepmother. This partiality was no doubt as unpalatable to the Stryngers, the Lamberts and the Etkyns, as it must have been to the Webbs; and we may be assured it was caused by a potent influence to have outweighed the arguments of the nuptial bed, as well as the maturer age and experience of Agnes, Joan and Catherine. Beyond the confidence reposed in her sagacity and discretion, Mary must have possessed her father's most tender love and regard; perhaps the consequence of those amiable traits of character which reappeared in her illustrious son and drew from his associates such reverence and affection.

The estate called Asbies, consisting of a house and sixty acres of land, was not the only dower of pretty little Mary Arden. At his second marriage her father had settled upon her and her sisters the reversion of other property at Wilmecote and Snitterfield, including the farm occupied by Richard Shakespeare. Possessed of such means the young heiress could look beyond the rustic and humble swains of her station and hope for a more knightly lover; but her steadfast and sensible mind fixed itself upon one object and the obscure young tradesman of Stratford found himself, a short time after Robert Arden's death, the master of Mary's maiden charms and modest fortune.

John Shakespeare and his young wife commenced houskeeping in his house on Henley Street in Stratford-on-Avon. Adding the dower of his wife to his own considerable savings Shakespeare was placed in easy and respectable circumstances. After his marriage followed happy years of prosperity and honor. His course of life from his first settlement at Stratford in 1550 until his marriage, in 1557, was of such a character that, when wealth laid upon him its powerful wand, his townsmen recognized in him a man "whose worth and honesty is richly noted." After mounting through several stages of official life, he was finally chosen Mayor, or High Bailiff, of Stratford. This happened in 1568; and for ten years longer his fortunate star remained in the ascendant.

In the meantime John Shakespeare's wife had not escaped "the pleasing punishment that women bear." Having first presented her lord with two daughters, who died in infancy, she gave birth, some days before the 26th of April, 1564, to the divine child who was destined to make the name of Shakespeare a household word in palace and cot—wherever the gracious influence of letters should penetrate. When his great son was born, the happy father was Chamberlain of the Corporation. He was engaged in business as a glover, in connection with which he marketed the fleece and the flesh of his flock of sheep, and dealt more or less in timber and cattle. He owned the house in which he lived on Henley Street, another on Greenhill Street, besides other properties scattered about the town and vicinity. He had the income from the farm at Asbies and a valuable interest in the share of his wife in the Snitterfield and Wilmecote estates. Notwithstanding such prosperity and the superior talents evinced by the man upon whom it had fallen, the father of William Shakespeare could neither read nor write. Such a man must have felt his ignorance keenly; and who can doubt that he resolved to educate, in all the learning of his time, the boy whose advent graced his happiest and most auspicious days. He possessed for the period of fourteen years after the birth of the poet, ample means to perform this resolve. In 1565 he was elected Alderman; in 1568-1569, Bailift; in 1571, Chief Alderman and in 1575 he purchased two more houses on Henley Street. From this year his affairs commenced to decline, but h was still solvent and of good reputation until the year 1578. The period within the years 1564-1575, tha is the first eleven years of William' life, marked the flood-tide of hi father's fortunes; and they did no grow desperate till the poet ha reached his fourteenth year. Durin this time John Shakespeare was on of the most influential citizens o Stratford; and, for some years he wa its Chief Magistrate—a position. then, of considerable pomp and circumstance. The eldest son of th first citizen of Stratford must hav had better oportunities, in the matter of education and experience i life, than the humbler children abou him. He must, at least, have received every advantage afforded b the educational institutions of Stratford. These advantages were fa from contemptible. In the reign o the fourth Edward, Thomas Jolyff had founded in the town one of thos parochial schools for the teaching o latin which then began to be introduced into England through the auspices of the Roman Clergy. Thi school seems to have prospered, for the sixth Edward granted it a charter. From 1572 to 1578, that is from the eighth to the fourteenth year o young Shakespeare's life, the masters of the Stratford Grammar Schoo were, successively, Thomas Hun and Thomas Jenkins. In thos times, a boy was placed at school, i at all, in his seventh or eighth year Before admission it was necessar that he should have learned to read and write; this was essential as the school did not undertake to give primary instruction. From this fact we may know that the poet received the teaching, for a time, of private tutors, for neither of his parents could read or write. When the quantity and quality of learning imbibed by his son was sufficient, perhaps in his seventh year, John Shakespeare followed the usual custom of prosperous citizens and placed him at school. Who can doubt, then, that from this time until the melancholy year 1578, William Shakespeare was assisted in his studies by masters whose interest it was to devote their utmost care and skill in behalf of the son of the foremost man in the town. The curriculum of the school was limited in range, but thorough in scholarship. It comprised a latin course and the rudiments of scholastic philosophy. By the method then in vogue the rules of grammar were illustrated and enforced by exercises which gave the pupil a practical knowledge of the principles of composition and corrected his taste; and it was absolutely necessary that the laws of verse should receive attention from those who scanned the hexameters of Virgil or the varied strains of Horace. History, mythology, philosophy, were at hand, clothed in the pompous garniture of latin, to reward the student whose in- led him to attempt their Having received the ut- ge that the school could bestow the student was ready for college; and it is a matter of speculation whether the acquirements of the poet, when he quitted school, would, or would not, have sufficed to open the doors of Oxford or Cambridge to him. There seems no good reason to doubt his fitness to enter the University; indeed it seems quite probable, in view of his advantageous birth and fortune, as well as his powerful and retentive intellect, that he had imbibed "the rudiments of many desperate studies." The love of reading once acquired is as tyrannical as the love of gambling; "keep a gamester from his dice and a good student from his book and it is wonderful." It grows by what it feeds on and it finds new food in the most barren and unlikely places. It reaches far and wide and penetrates into secret nooks and rises to unwonted heights, or sinks below its mean, happy in the midst of travail if its search be successful. Guided by this enthusiastic and omnivorous instinct Shakespeare could not have missed reading the few books at Stratford, in the hands of his schoolmasters and tutors, or the clerical incumbents of the parish. These were for the most part latin classics; but it is not likely that Chaucer and Sackville and Harrington were altogether unknown in Stratford. Perhaps copies of the rude dramas of Marston and Taylor had found their way thither in the company of some traveled provincial or wandering cit; and Ascham's "Scholemaster" might well find place on the scant shelves of dominies Hunt or Jenkins. Whatever books could be found at Stratford would certainly be within the reach of young Shakespeare, and that he read all he could discover is certain to a demonstration.

At any rate we know he had six years of schooling; and six years of a bright boy's age, from eight to fourteen, is a lifetime for an ordinary plodder. At that age many aspiring minds have presented enduring credentials to fame. Chatterton, Pope, Paschal, our own Bryant, and, in some degree, more lately, the Goodale sisters, have shown that youth and inexperience does not prevent the fair buds of genius from blossoming. Youth and erudition, inexperience and enlightened sagacity, are not so infrequently found in each other's company that we wonder to find them so; indeed as we read of the intellectual exploits of Porson and Spencer and Paschal, when scarcely beyond the years of childhood, our surprise and admiration are tempered by the knowledge that many English, French and Yankee lads exhibit the same proficiency now-a-days.

When Young Shakespeare had reached the age of fourteen years, his father's good fortune seems to have deserted him. His descent was as rapid and disastrous as his rise had been gradual and auspicious. In this fatal year, 1578, Mary Shakespeare's farm at Asbies, was mortgaged and eventually lost; her interest in the other lands alienated; her husband, distracted by the ruin of his fortunes, became irregular in attendance at the corporation; and, so fallen was his estate from its former "high blown pride," he was exempted from taxes for the poor rates, on the plea of poverty, and declared in default on a tax for arms. In this year, or shortly thereafter, young Shakespeare was taken from school. The encroachments of poverty still continuing, his father was fain to reduce the hungry mouths at home by apprenticing him to a butcher. At the age of sixteen all boys are poets, full of fantastical notions, clairvoyant to the most sensuous and riant influences in nature; but the fancy that in a few years was to create a Romeo and a Juliet, and run riot in "Venus and Adonis," must have marked its possessor with a more powerful and enduring afflatus than the *dolce far niente* of puberty. The delicately humane mind that could describe the wounded deer in "As You Like It" with such pathos and feeling must have found the bloody and brutal occupation of a butcher repulsive to the extremest sense. Obeying with reluctance the commands of filial duty the youth exchanged the sweet companionship of letters for the obscenities and brutalities of the slaughter-pen. This was the "bloodiest shame, the wildest savagery, the vilest stroke," that could befall a disposition so full of gentleness and sensibility; yet the experience had its function in developing the universal mind of Shakespeare. There is a silly tradition that "when he killed a calf, he would do it in a high style and make a speech"—thus finding a congenial atmosphere for the germination of histrionic genius in the fetid vapors of the abattoir. Perhaps in some boyish freak, during the absence of his master, the youth enlivened his grim duties by stabbing Cæsar, or relieving Macbeth of his head, in the person of his bleating victims; but this must have been hysterical amusement at the best. There is more food for tears than smiles in such a story. Like an infant lost upon a battle-field, he may have dabbled his hands in blood and played with the horrors around him; yet the realization of his unhappy situation was ever present. But the black cloud had the usual silver lining. There were holidays and moonlit nights for journeys and boyish escapades in the environs of Stratford. In the company of other youths, as wild and wanton as himself, he may have often scandalized by his conduct the staid burghers of the town, and furnished in himself the model for the future Prince Hal. Yet, while cast by despair into such courses, he could not live surrounded by the lovely scenery of Warwickshire, without developing his natural love for the sublime and the beautiful. The sinuous Avon, winding between grassy banks, redolent with the odors of wild flowers; the Charlecote park and its abundant deer; the surrounding hills, tinted with the delicate hues that nature lends to distance in that climate; a sky almost Italian in brilliancy and the traditions that always hover in the air of little country places, making their heroes, their fairies, their myths and their ghosts so real that even the sober touch of age cannot dispel them, all conspired to form the master genius which was suddenly to spring to maturity. Under these influences the boy grew toward adolescence unconscious of his powers—a foundling Appollo fostered by mortals who could never realize or appreciate his divine superiority.

THE ACHIEVEMENTS OF MECHANICAL ENGINEERING.*

Gentlemen,—Among the various duties devolving upon the president of this society, is that of saying something at the time and on the occasion of his retiring from the position of honor in which you had previously placed him. With no hope of making up in prating words for any of my previous shortcomings, I accept this duty now devolving upon me, and shall attempt, briefly, to say something about the mechanical engineer, his position, and mission.

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*Address of retiring President, J. P. Holloway, to the American Society of Mechanical Engineers at the sixth annual meeting held in Boston, November 10th, 1885.

Brief as is the history of this society, it has already been shown that there was a necessity for its organization and existence, and the rapidity with which its ranks have been filled up, and the character and standing of its members, alike show how widely felt was the want of some nucleus about which the members of our profession might cluster.

Of the advantages that will in the future grow out of the formation of this society it is yet too early to speak, but the benefits that have come to us all by reason of our connection with it, by reading the published transactions, by attendance at its meetings, by participating in the discussions, and, above all, by the pleasant acquaintances made at its social gatherings are, I am sure, not only apparent, but are fully apprecited by all whose good fortune it has been to join in them. The term engineer, is a generic one, capable of being divided into a great many subdivisions; just how many it is difficult to say, as the necessities of civilization, and the advancement of science has made it necessary to add new specialties, each of which is of sufficient importance to occupy the full time and energy of a special engineer in order to master and direct its details.

While I would render honor to all branches of the profession of engineers, and would most certainly underrate none, I cannot but believe that in depth and breadth of usefulness, and for the final consummation, and for those final practical results that best promote the comfort, safety and progress of humanity, the mechanical engineer, by reason of the fact that he, most of all, is concerned in the moulding and directing of the material forces of nature, stands the peer not only of any other engineer but of any other man as well. It was well and truly said by one of the founders of this society, that the profession of mechanical engineering underlies all engineering, and it requires only a moment's thought to make this apparent.

While the civil engineer may plan and locate his railways, canals, aqueducts, bridges or tunnels, it is the mechanical engineer who is called upon to devise the machinery and tools with which they are to be constructed.

The naval or military engineers, guided by the experiences of the generals or warriors of the past, may plan defences by land, or sea, may design forts, or iron-clad ships, but when their resources are exhausted, it is the mechanical engineer who is called upon to build the ships, load them with defensive armour, and to not only provide them with powerful guns but also to provide the mechanism by which not only the guns are to be handled, but by which the ship itself shall be manœuvered and driven, alike through stormy and calm seas.

As an example of the fact that in the prosecution of modern warfare, the mechanical engineer has become a most important factor, it is said, that during the progress of the late Riel rebellion in the country adjoining our northwestern boundary, one of our engineering firms which manufacture a rapid running multiple gun, with a view of extending their trade, sent an agent with one of their guns to the scene of strife, hoping that owing to the scarcity of troops, and the difficulty of transporting them up there, they would find a market for their machine gun. The agent arrived in camp just at the time when, after a good deal of marching and counter-marching, the belligerents were at last by design or accident brought face to face. With the push natural to an American, the representative of the firm was early on the ground, and running his machine far in advance of the regular troops he unlimbered his gun, and grasping the crank devoted himself to the task of showing what a mechanical soldier could do, and the account said, that, unmindful of the storm of bullets that flew about him from the opposing foe, he turned his crank with such increasing energy that he actually won the battle before the regular soldiers had a chance to fire a shot. While this incident serves to illustrate the value of the mechanical engineer and his contrivances in modern warfare, it is only proper and just to say, that the success in this case was largely due to the pluck and industry of the American drummer who turned the crank.

How helpless would sit the mining engineer above his earth-bound treasures, be they never so rich, did not the mechanical engineers come to his aid to lift them from out their rock-ribbed home, and with fiercely fanned furnace fires free them from their impurities and dross?

Even the giddy goddess, fashion, whose ways none can fathom, would, like Alexander, sigh in vain for other worlds to conquer, did not this same mechanical engineer, like gallant knight of olden time, come to her aid, and with ingenious and studied transformation of wheels, and cams, and flying shuttles, bring new combinations to woof and warp, whereby the silken threads turned into new channels, reveal a hitherto hidden beauty which, for the time, captivates all beholders. And so it is through all the industrial pursuits of life which require for their prosecution the handling and the transformation of crude materials into forms of usefulness and beauty.

While it is true that scientific and technical training is, and must ever be, of great advantage to the mechanical engineer, there is yet another source from which, after all, he will derive by far the most benefit, and that is—experience. Not necessarily his own experience, but the experience of others, and of all ages as well; and I know of no other way that he can be so benefitted, and aided, all through his life.

I ever think of experience as of a vast store-house, the corner stone of which was laid upon that day when the unbarred gates closed behind our first parents as they left the paradise of Eden; a storehouse to which each successive day since that time up to yesterday has added extended length, and increasing stores. In this vast edifice every man of every occupation or profession, has had his nook in which to pile up the experiences of his life. Of the great mass of knowledge therin stored, hidden by the accumulated dust of ages, little has come down to the present, but who does not regret that more cannot be known of the members of our own profession, who in remote ages builded so well that even the ruins of what they accomplished challenge our admiration now. What an addition it would be to the literature of engineering, could we have the clearly interpreted published transactions of these engineers, who, thousands of years ago, built a Suez canal through a country in which in our day DeLesseps could do no better than to follow. Could they be spread before us how much of interest would cluster about the discussions of the mechanical engineers who planned the pyramids, and contrived and executed plans for quarrying, transporting and erecting those numerous obelisks that once dotted the plains of Egypt. Who would not, were it possible, scan with interest the drawings and plans of those engineers of ancient Carthage, who, when Europe was fringed only on its southern limit with civilization, came over to Spain, built pumps, drained and worked mines opened ages before by other and to them unknown engineers.

The steady, onward tread of those Roman legions which once made Rome mistress of the world, was made possible by the labors of the sagaicious and skillful engineers who built for them imperishable roadways, spanned rivers with bridges that are marvels to-day, and who laid so deep, so permanent, his foundations in the then far off "Isles of the Sea," that the engineer of the present, as he excavates for his railways and buildings, often reaches the imbedded stone or crowning arch laid by his professional brother thousands of years ago.

But, not alone would we be interested in knowing something of the experiences of those far off engineers, who in the dim past accomplished so much with so little. We would as well be greatly interested, and greatly enlightened could we know more of those who nearer to our own time have accomplished so much for the benefit of the world at large. While it is true we may go to that garret in Heathfield, where he whom we are now pleased to call the father of the steam engine, James Watts, lived and labored, and may stand beside the bench whereon he worked, may see the lathe which yet has in it the unfinished job he left there, and beside which his leathern apron lies as [illegible] and while all these from their associations would be of especial interest to us all, who know how much the onward progress of the world was indebted to what he accomplished for the steam engine, there will still remain much we shall never know of James Watt and his experiments. None will ever look upon James Watts' scrap heap; one can do no more than imagine of his studying, his planning, his model making, his trials and his failures as he worked out the problems of expansion, contrived the condenser, air pump, valve motion, governor, indicator, and indeed every important feature of the successful steam engine of to-day. That he had a scrap pile which received his failures we may well believe, for where is the engineer, who has accomplished anything worthy, who has not hidden away in some secluded nook, or corner, his pet schemes that come to naught, his long dreamed of hobbies which some inexorable law of nature defeated; his neglected but never quite relinquished models, which were to work wonders, and over which at long intervals he sits and dreams, and promises himself at some time in the future to take in hand and work out to a successful ending. That level-headed, canny Scotchman, George Stephenson, who drove the "Rocket" at Rainhill on that September day in 1829, and whose practical, good common sense and industry did so much to make the railway and locomotive of his day a success, has hidden away in his lock-up, in the vast storehouse of which I have spoken, several, need I say unfinished, models of perpetual motion.

It is said of the late Matthew Baldwin, one of the earliest and best known builders of locomotives, one whose practical good sense, industry, perseverance, and long-accumulated experience contributed more, perhaps, than that of any one else in bringing the American locomotive to its high degree of efficiency, that all through his life he was haunted with an idea that a rotary engine could and ought to be used for propelling a locomotive; and, no doubt, that in his pencil sketchings, among his models, and in his scrap corner during his life, might have been seen here and there the outcrop of a hobby which in his dreams and in his leisure moments rose up before him like Banquo's ghost, and which, like it, in spite of all his failures, "would not down."

Since time was young, it has been the mechanical engineer, working often in the most obscure manner and in the most humble circumstances, who in the end pushed rapidly forward the car of progress.

While it is possible, by the aid of history or tradition, to trace back to their origin some of the innumerable inventions which have so benefited the world, how many yet remain about which nothing is now or ever will be known. Think for a moment of that vast host lying in unknown graves, who in the past, amid poverty and discouragements, toiled from early morn until the night was well spent, in some obscure garret, or smithy, or workshop, to devise and perfect some simple machine, to contrive or manufacture some article now so common, so universally used, that its sudden removal would work a world-wide injury. While none will question the value of the engineer in aiding the progress of the past, all will, I think, agree that at no time in the history of the world was he so important a factor as he is to-day.

Standing in a city whose enlarged culture and great wealth was made possible by, or indeed is the direct result of the labors of the mechanical engineers, who by their skill and industry have filled all the valleys of New England with flying Spindles, busy wheels; whose ingenuity has relieved all labor of its drudgery, and whose inventions have given their country a world-wide renown, I need not, I fancy, speak at large of the mission of the mechanical engineer, or of what he has accomplished.

A stranger standing in the midst of the glories of Westminster, asked to be shown the memorial or monument of the builder. He was told: "Would you see the monument of Sir Christopher Wren,—gaze about you." So answer I. Would you know the mission of the mechanical engineer,—gaze about you wherever in the civilized world you may be.

Putting aside all the wondrous history of by-gone ages, blotting out all the engineering triumphs of the middle ages, calling the time of Shakespeare, and Milton antiquity, and coming down to within a brief century, or if you will, to the brief span of a single generation, and what, or rather what not, has the mechanical engineer accomplished. So broad, so varied, and so universal has been the field of his action, and of his triumph, that I find no time to begin even an enumeration of what he has done. A thoughtful woman gazing at the ceaseless, steady action of an immense engine, driving with tireless speed the ponderous steamship through storms and calms, said half in soliloquy, but wholly in earnest, "Engineers ought to wear crowns."

While it is true that at least in this country the position of any man or set of men will be what they themselves make it, it is nevertheless a fact that the public at large are wont to accord eminence and praise to those most in view, and oftenest heard. In the history of the olden time it was the kings and rulers who occupied much of the attention of the public. Later on, and for a much longer period, it was the chieftain, or warrior, whose praises were sounded by the orator and poet, and the prowess, the bravery and chivalry of the Knight Errant, surrounded with environments of waving pennons, floating banners, and glittering armor was the theme of poetry and song through many ages.

Hannibal and Napoleon, with their armies, crossed the Alps. Their pathway amid the clouds was strewn with thousands upon thousands of those who fell by the way, and of the proudest armies who at their base began the ascent, comparatively few reached the sunny plains beyond.

They had indeed crossed the Alps, but behind them their snowy peaks defiantly touched the clouds, unharmed, unconquered. Long years after these warrior chieftains had crumbled into dust, another, mightier than Hannibal or Napoleon, came to the foot of these rock-barred barriers, which for the ages past had defiantly said alike to king and peasant, "Pass me only at your peril." With no long retinue of soldiers, no vast caravan of horses and elephants, and bleating herds, no waving banners, no blare of trumpets or cry of herald, came the conqueror of our day. Seeing the weary traveler and burdened beast climbing with patient toil along the narrow pathways, and about the storm-beaten crags half hidden in the clouds above him, and beside yawning gulfs no eye could fathom, he bethought him of a better way. Seeing near by a rushing torrent, which for ages had unconfined, tossed high in the air its flakes of foam, he knew he had in that a giant force to do his bidding, so, curbing and guiding its wild spirit, he bade it turn his wheels, swing his cranks, move to and fro his ponderous plungers and pistons. He made swinging valves at each opening stroke to gather in that wildest, freest and most untamable of all elements, one of which it was said long, long ago, "It bloweth where it listeth"—the air—and driving it before him through long and tortuous passages, he made it to knock with arm of steel upon the portals of the hitherto impenetrable walls. You know the rest, with highest skill, and unceasing industry he bade the spirits of the air, and water, alike to his behest; guiding them to the right and to the left, up and down as occasion required and from either side, through months and years, until at last the hitherto defiant walls are broken down, and the eager men leaped through the rent mountain, not to engage in deadly conflict or savage hate, but to clasp each other in bonds of equality and fraternity. Through this open portal, to-day, on roadway of steel, luxurious carriages glide swiftly and securely, filled with the inhabitants of all lands, on errands of peace, pleasure and good will. Other vans loaded with the product of the field and vine, the spindle and the loom, alike pass from Italy's sunny plains to the north land of snow and ice, for barter or exchange.

Need I ask who conquered the Alps, the soldier, or the engineer? Need I ask whose triumph has contributed most to the welfare of all the world—the generals who went over the Alps, or the engineer who went through them? Let Mont Cenis and St. Gothard answer.

The day of the professional warrior, the swash buckler of camps, whose sword was on hire for any cause, has passed forever and he is fast dropping out of sight. That there are, and it is to be hoped ever will be, men who for their country's defence, and for the cause of right and justice, will peril their lives on the field of battle, we fully believe. 'Twas such a one who, but a short time since, was borne to his last resting place, followed by a nation in mourning, and, for whose requiem tolling bells, beginning with the early dawn upon our eastern coast, awakened new echoes in every town and hamlet across the broad continent, until with the setting sun they died out amid the murmuring waves of the Pacific.

As the comrades in arms of this great man came together to devise some memorial that should perpetuate his worth and keep his memory green, with one accord they said, let not his monument be of broken swords, and captured guns, with all their attendant memories of conflict and strife, but rather let the sculptor with his highest art and best skill, transfer to the enduring marble the semblance of the great citizen, sitting in the shadow of his home, and under the shadow of an impending fate as well, facing calmly death, which, baffled on a hundred battle-fields, held him now within easy reach, tortured with a pain we can but at best imagine, using his last hours and waning strength in writing a memoir; not to place himself higher on the rolls of fame or in the hearts of his countrymen, but to leave behind him comfortable sustenance for the family he so much loved, and from whom he was soon to part. This sentiment of his comrades, the officers and soldiers of the Grand Army, and which so accords with the feelings of all who admire the kindness of heart, the inflexibility of purpose, and the absence of all vindictiveness of the great warrior, and greater citizen, General Grant, illustrates most fully the change in public sentiment of which I have spoken; and illustrates, as perhaps it never so well illustrated, the truth of the saying that "the pen is mightier than the sword." And let me add, that among the pens that have accomplished mighty results for the progress of civilization, liberty and equality, is the drawing pen of the mechanical engineer.

There remains but one more thought to which I beg your interest and indulgence, and that is the position of the mechanical engineer with regard to his fellows. It is not many years ago since, when the mechanical engineer knew far more of the men of all professions than he did of his own. It was not many years ago that the leading members of our profession knew but little of each other, except by reputation, and I disclose no secret when I say that there was little endeavor made to do away with the exclusiveness and distrust, to use no harsher term, that to a certain extent was prevalent then. Happily all this is changed now. The formation of this and similar societies, the frequent meetings of conferences held the comparison of methods, the recitals of our successes, and the avowals of our failures, together with the knowledge that has come to us all by reason of this interchange of views and experience, makes us all to feel that we live in a wiser and better age.

But not alone in a professional way have we been benefitted by these gatherings. The harmonious union of men, standing high in the attainments of their profession, high in the regards of the public; representative men in communities spread all over the land, by such meetings as this, held in the important industrial cities of our country, in each of which their best citizens have come forward to greet us with most cordial welcome, there has been shed a new luster upon the protession of mechanical engineering, and it has been raised to a still higher plane of usefulness and observation. But better than all. by these meetings we have come to know each other, as in no other way would it have been possible. In this acquaintance, we have been taught a broader charity for each other's feelings; we have come to know something of each other's trials and misfortunes, and to find on every side warm hearts, filled with generous impulses ready as well to give as to receive.

Let it be our ambition to so conduct ourselves that we shall ever honor our calling, and shall assist in raising it in the estimation of all to that high position of honor and usefulness to which, by reason of what it has done, and is doing for the world and humanity, it is so justly entitled.

GOLD MINES AND MINING IN CALIFORNIA.

The auriferous territory of California is so extensive, the deposits so numerous and diversified, the implements and methods employed in working them so various, and their development in such different stages of progress, that in writing about these things, one can, in a mere letter, treat the subject in only a very general way. To enlarge upon or even mention idividual properties, enterprises, or localities, is out of the question; some brief remarking on the above, more general topics being about all that can be done.

Proceeding, then, to deal with these topics in the manner indicated, it may be observed that the business of mining for the precious metals in California is in a fairly prosperous condition, being active, remunerative, and progressive in nearly all of its departments. In the matter of correcting former mistakes and purging this industry of its many abuses, much has been accomplished, winning to it the support of certain classes who before would have nothing to do with it. Owing to diminished water supply, the snow-fall having been light on the mountains last winter, the

HYDRAULIC MINING

season has been a short one; the water in many localities having already given out, this being about a month earlier than usual. As this scarcity of water will stop also a few of the quartz mills, the annual bullion product of the State would have suffered some shrinkage had not this loss been made good by increased yield from river-bed operations, which, through the occurrence of a low stage of water early in the summer, gain just to the extent that these other branches of mining lose by reason of a dry season.

Despite injunctions, a good many of the hydraulic mines continue to be run, their owners finding means to evade the restraining process of the courts. The most of these mines are operated under leases obtained by the Chinese, who, through recourse to their peculiar methods, manage to escape arrest, or, if arrested, manage, by these same methods, to keep their leased claims, and also those they purchase, running all the same. In a few instances, the whites have also, under one pretext and another, been able to continue gravel washing, the plan usually adopted in these cases being for the responsible parties to keep out of the way.

THE WAY THE HEATHEN CHINESE DO IT.

By the Chinamen, however, a different course is pursued. If the process-serving officer, arriving on the ground, wishes to make an arrest, he is permitted to do so; that is, if he can find out who among a herd of jabbering pagans is the proper man to arrest; for he cannot take the whole gang into custody. If the minion of the law hangs around and persists in making trouble, some one in the lot is pointed out to him as the "boss," who, thereupon, is seized, carried off and locked up in the county jail, where he is suffered to remain, it not being the policy of his masters to bail him out. He does not, in fact, want to be bailed out. Why should he, seeing he is leading what, to him, is a life of luxurious ease—the public boarding and lodging him better than he ever was boarded and lodged before, while his employers allow him his usual wages as long as he is incarcerated? To fine the prisoner, as might be done, would, of course, be a farce. The plan of arresting the entire working force at a mine has not been adopted, as this would only be making matters so much worse. The responsible parties in these cases consist of moneyed men or laborers having money, and who associate themselves together for the purpose of leasing this class of properties, which under the circumstances, they are able to do on very easy terms. Once in possession, they know that, by recourse to the above methods of procedure, they can continue work without serious interruption. The expense and trouble they are put to in thus defeating the law and baffling the orders of the courts they do not mind in the least, as these companies, getting the mines all outfitted and in working order on very low terms, invariably make large earnings.

So far, the authorities have not been able to find any way of dealing effectually with these violaters of the law, and, failing to do so, there is danger that this class of mines will ultimately fall into the hands of these foreigners exclusively. In this event, besides the heavy loss entailed on the original owners, it would happen that none but Chinese labor would be employed in working them, while all the gold taken out would be shipped directly to China, there to remain. Such a result being imminent, it is highly probable that the Legislature of this State will, at its next session, take such action as will enable the owners of these enjoined mines to resume work upon them, having first built suitable dams and other receptacles for holding the coarser and more damaging portions of the *debris*. That they will be permitted to experiment farther in that direction is almost certain. The conditions favoring the retention of this material up near the mines have been every year improving, and are now such that it could be very effectually there retained by the means proposed. This would be relegating the question to the basis of Judge Temple's decision, afterward overruled by Judge Sawyer, who denied the mine-owners the privilege of making trial of reservoirs and dams. With Judge Temple's decision the miners would be content, building the impounding structures at their own expense. Were this course adopted, it would lead to a final if not altogether satisfactory disposition of this vexatious business; at least, so far as the farmers and miners are concerned.

It should be stated that not all the hydraulic mines in California have been enjoined by the courts from running. Only those in the more central tier of mining counties have been so stopped; in other words, those that outlet into the American, Bear, Yuba, and Feather rivers and their tributaries. Those located in Trinity, Siskiyou, and Del Norte counties, which discharge their tailings into the Klamath and its confluents, have not been molested, nor is it likely they ever will be, as none of these streams are navigable, nor are there along them any lands or other property, rights, or interests exposed to injury by this waste material from the mines. Though not conducted on as large a scale as are many of the enjoined properties farther south, the hydraulic operations along these northern rivers are quite extensive, and, by reason of the favorable conditions that obtain here, promise to increase both in magnitude and number. Besides exemption from the *debris* troubles, the country here is well supplied with water, which short and inexpensive ditches suffice to carry on the mines. The auriferous gravel is tolerably abundant and of good grade, and, being but little cemented, and free from volcanic capping, can be worked effectively and cheaply, there being nearly everywhere fall enough to insure all needed dump. Looking over the field, there seems enough to warrant the conclusion that hydraulic mining, whatever inherent and extraneous obstacles it may have to contend with, is nevertheless destined to have a long life in California. The present annual output of these mines amounts to about two million dollars, less than a third of what it would be had not their production been so restricted by the action of the courts. As premised, the present is likely to prove a good year for

RIVER-BED MINING,

a business that was formerly carried on along nearly all the larger gold-yielding streams of the State, but now confined mainly to the Trinity, Scott, Klamath, and Salmon rivers, the little continuing to be done elsewhere being mostly by the Chinese. This, up to the time the rivers became depleted of their treasures, was a very remunerative and, therefore, very popular style of mining. Afterward, it fell to a low ebb, having been given up pretty generally to the Chinese. Of late years, it has experienced some revival, and when the several tunnels driving to receive and divert the water at points where the rivers make short curves, thereby laying bare long stretches of their beds, shall have been completed, there will be taken from these reclaimed portions of the streams such quantities of gold as will, in the estimation of those engaged in projects, tell sensibly on the gross product of the state. The river-beds in California will continue to be worked, for a time, at first with increasing and then, no doubt with gradually diminishing returns. The day of their final exhaustion is afar off—too far to much concern the present generation.

DRIFT MINING.

Through a general avoidance of the mistakes, very common and very disastrous during its earlier stages, this has come to be a tolerably safe and profitable branch of mining. It is pursued mainly along the channels of the Pliocene rivers, and under the table mountains in the more central portions of the State, where a good many enterprises of this kind are carried on, some of them costly and of great magnitude. While Forest City, in Sierra County, and the Damascus Divide, in Placer, remain prominent centers of drift mining, many other localities are coming into note, the partial suspension of hydraulic operations having imparted quite an impetus to this branch of mining. While the deposits adapted to be best worked by drifting are very extensive in California, their development will proceed slowly, as it takes time as well as money to explore and open them up. Thus far, they do not appear to have recommended themselves to capitalists, nor are they likely to do so in any special manner. Experience has, in fact, shown that they can be worked to best advantage by associations of practical miners, all the marked successes in the drift diggings having been achieved by companies of this kind. The gold product from this source is estimated at between three and four million dollars a year. It will, in the course of a few years, be considerably larger. The various

OTHER BRANCHES OF PLACER MINING,

such as hand and ground sluicing, working the beach sands and the seam diggings, re-washing the tailings, etc., all continue to be practiced in California; now, of course, for the most part, only in a small way. In the winter, when water is plentiful and free, ground sluicing is carried on in many localities. In the summer, some of the gulches are worked over, the bed-rock being dug deeper and the banks washed further up. Schemes for moving and washing over the tailings that in great quantities have lodged in the mountain ravines are in progress; Slate Creek and Shirtail Canon being the sites of the most notable projects of this kind. Since the partial stoppage of hydraulic mining, some of the water before used in piping is employed in washing ground with which nothing could before be done in summer. The two large companies that own Gold Bluff, the strange deposit on the seashore, go on collecting much gold by the novel methods here practiced for thirty years or more, while small companies of miners, mostly "squaw men," contrive to make small wages washing the auriferous sands found along the ocean beach farther north.

And thus it is, the gathering of gold from the California placers goes on, their aggregate yield continuing quite large, notwithstanding that the world had come to believe these placers were depleted to the point of abandonment long ago.

It is, however,

THE QUARTZ MINES

of California that are to prove her most prolific and permanent source of gold production. Having in a previous letter alluded to the increased interest taken in quartz mining in this State, it will suffice to say now that such interest continues unabated, being kept alive by the favorable condition and outlook of this industry in all parts of the State. In the depression, now so prevalent in most other lines of business, is to be found another incentive for our people to turn their attention so sharply to this branch of mining. In the field, work goes on very briskly. Prospecting is active, leading to the discovery of valuable lodes all over our auriferous territory. These finds are followed up very generally by development, and this again by reduction-works, of which a good many have been erected within the past year or two, some of them being of large capacity. As a rule, however, the old error of putting up mills too big or too soon is avoided. Out of this awakening to the subject of quartz mining, there has grown a corresponding interest in the means to be employed for reducing this class of ores. As a consequence, the inventors have been busy, and numerous are the new mechanisms and processes claiming the attention of the mining public. As many of our miners are men of limited means, and many of their lodes afford comparatively little ore, a small, cheap mill of improved pattern has come to be with them a desideratum. Among other machines claiming to fill this want is the Wiswell pulverizer and amalgamator, an improvement on the old mill and a Boston invention. It is simple, cheap, and durable, and appears to be doing good work; but if it wins at all, it will have to win on its merits, the average California miner being prejudiced against any thing having its origin abroad.

One of the special fights that is waged in this province of invention is that directed to supplanting the old-fashioned stamp by something more cheap, simple, and durable. While this end has not yet been attained, it is by good judges believed that it soon will be. That some gains have already been made in the business of beneficiating this class of ores in California, may be inferred from the fact that a great deal of quartz is now worked here with profit that does not pay over four or five dollars a ton; whereas, twenty-dollar ore was at one time rejected as worthless. While the yield of gold from this source will be somewhat larger this year than last, it will be yet another year or more before these presenting greater activities in the business will be made manifest in a largely increased production. The value of the gold taken from the quartz mines of California the present year will reach, and may possibly exceed, eight million dollars.

THE ESQUIMAUX.

The winter life of the American Arctic native, or Esquimau, is much more interesting than his summer existence, which partakes so much of the general life of savages with a few uninteresting changes, while in the winter time we have a mode of life so radically different from that of any other people, by their peculiar environment, that the first travelers among them to describe these strange details were looked upon as Munchausens of the greatest breadth of imagination. Houses of ice and snow, the very last thing in the world that a person would take to make a comfortable abode anywhere, were reputed to be their winter habitations.

They lived on raw frozen meat in a temperature where it would be agony to any one else not to have their meal hot and steaming; and so on through social economy, leading a perfect life of social paradoxes.

By most ethnologists it has been claimed that this strange nation found itself in its frigid land as a result of national weakness, "crowded to the wall" as it were by superior races, and that wall a wall of ceaseless ice. I am a firm believer in the opposite, or that the Esquimau finds in the North his most congenial clime, and we find to corroborate this the perfect contentment of the people with their country, their hesitation in leaving it for however short a visit, their longings to return when absent; many other reasons show that they are naturally natives of the north land by their own choice and not that of others. They are no more held to the rim of the cheerless Arctic Sea by other races than are the musk-oxen by the buffalo, or the polar bear by the grizzly. That they are more than satisfied with their cold country and its phenomenal low temperatures is amply shown, I think, in their preference for their winter life over that of the summer, although their struggle for an existence is much harder then, as viewed from our point of hardships, in the terrible exposure and oft recurring famines, for which they seem to care but little. Now let us take a look at that winter life in the light of one who has lived as an Esquimau for over two years among them, for every one will admit that some additional light is needed, so little do they have in the winter season.

A few premonitory frosts commence in the Artic fall, generally followed by a blustering northern storm of snow snd sleet, and then with a sharp snap the thermometer sinks to the minus twenties and thirties and the Arctic winter is upon them, and as the schoolboy dialect would have it, "for keeps too." This varied from early September to late October in my travels, occuring on King William's Land at the former time in 1879, and in North Hudson's Bay at the latter in 1878. This sudden onslaught of the winter does not drive them at once into their peculiar houses of snow, glad as they would be, however, to avail themselves of such an abode; for the first snows that fall are not of the right texture for this Arctic architecture. Fully forty degrees below zero must have been reached and a number of fierce gales must have "packed" down the autumn snow before it is of the proper consistency, or *sec-tu-u-ad-lo* (heavy) as the Esquimaux call it, to be cut into the curious blocks or huge bricks of snow with which they make their snow-house; (*igloo* of the Esquimaux) looking so much like the old-fashioned pictures of bee-hives with their oblate shape. Their skin tents are altogether too cold to live comfortable in them long before that time comes around, and the Arctic carpenter is driven to another curious material for building to keep out the bitter cold, and that is the pure ice from the many fresh-water lakes and ponds with which their country abounds. When about six inches thick they cut out slabs about the size of an ordinary house door, put them upright on their ends, joining them edge to edge, making a little circular pen of ice about ten to fifteen feet in diameter, over which they put the summer tent for a roof. These houses of ice are as transparent as glass, if clear ice has been formed, and when finished one can look through and see what his or her neighbors are doing without the trouble of getting down on his hands and knees and crawling in to find out. These glass-like houses thus completely kill all incentive to gossip, as an essential element thereto, ignorance of the person talked about, is wanting. I am pleased to add however, that the malicious variety of this trait is wholly unknown among these distant people.

The house of ice, while warmer than a skin tent, will not compare with one of snow, and as soon as this material is of proper texture, an *igloo* or snow house is constructed. I will not dwell on the construction of the *igloo* to any great extent, further than saying it is the shape of a half egg cut perpendicular to its axis, and about six to eight inches thick in the blocks, which are about thirty inches long by half as wide. The most common errors regarding the Esquimau snow-houses are, that these big blocks are laid flat, when they are really on their longer edge, and that they form one course above another, like we build a brick building, when in fact, there is but one course, spirally twisting around from bottom to top. While the blocks are but six to eight inches thick, the *igloo* is often made four to five or even eight to ten times as thick during very cold weather, by a banking of loose snow thrown over it.

Of course the temperature can not get above freezing in these homes of hard snow, or the structure will commence melting and eventually tumble in; but it must be remembered that a person can soon get used to a temperature just a few degrees below freezing, and even be quite comfortable. I must say that after a person has gotten thoroughly acclimated to the out-door winter life of the Arctic, a temperature of 20 deg. to 32 deg. Fahrenheit is every bit as comfortable as one of 70 deg. to 80 deg. to a person coming into the house from a temperature well below freezing. I distinctly remember one curious effect on the white men of my party during the cold of the first incoming winter. Every one has probably felt the loss of managing power in the fingers when numbed with cold, and inability to write or button or unbotton a coat or other garment, or anything requiring considerable manipulation and play of the fingers, and we, of course, were no exceptions to the rule at first. Being constantly in this temperature, however, and almost as constantly exercising our fingers under these disadvantageous circumstances, I was greatly surprised to see how rapidly these functions of the fingers were restored, until by time the winter was over they were actually as perfect as ever in any temperature, however cold, and this too, despite the fact that there still remained, as before, the disagreeable sensation of cold in them at times. It seemed as if the motor and sensory nerves could be made absolutely independent of each other, and this benefit, which allowed me to thread a needle and sew below freezing, to use a sextant for observations at minus forty degrees Fahrenheit, or clean and insert cartridges in a magazine gun at even twenty degrees lower with ungloved hands, I believe I still, to a certain extent, retain, although all others accruing from Arctic acclimatization have disappeared in my five years away from that zone.

If a comfortable house made of ice or snow seems singular during intense cold, how absurd an enjoyable bed made of the same material must appear; and yet their bedsteads are made of snow, the mattresses of many layers of musk ox and Polar bear robes and undressed reindeer skins, while the sheets are dressed reindeer robes and the covers of the same material, their pillows being their reindeer clothing rolled in a bundle at the head of the snow bed. Here, stark naked, with only one reindeer skin over them, they will sleep as soundly as a farmer in more favored climes after a hard day's work, and that with the temperature out of doors so low that every breathing thing is enveloped in a cloud of its own making.

The amount of cold these northern nomads can endure, however, borders on the phenomenal. I have seen the little babies, two and three years old, perfectly naked, for hours at a time, on the reindeer robes of the bed in the *igloo*, the temperature, as I have said, being constantly below freezing; and in the fall I have seen them naked, playing and splashing in a pond of water, long needles of ice forming on the quiet place. I once saw an Esquimau baby boy taken from its mother's hood, and naked, made to stand on the snow until she found its reindeer skin clothing from the sledge, a fairly strong wind sufficient to drift the loose snow along with it, blowing at the time, the thermometer minus thirty-eight degrees, the only protection it had, being behind a sledge loaded about three feet high, around and over which the wind poured. Its exposure thus was a good minute, and to appreciate this one must take a watch in his hand, and see that length of time drag by, a time that a not unconscientious but sensational writer might readily jot down as five or ten minutes. And I have known a naked man, surprised asleep in his *igloo* by a polar bear, hastily grasp a gun and pursue his enemy two or three hundred yards in the snow, the thermometer fifteen to twenty below zero, and slay him. These Esquimaux rub slushy snow, dipped in water, on the bottom of the runners of their sledges, with the open palms of the hands until it freezes into solid ice, the thermometer being from zero to seventy below, when I have known it to be done. I have seen an Esquimau throw himself on the snow and rest comfortably for half an hour, the thermometer seventy-one degrees below zero, or one hundred and three degrees below freezing; and probably doing some light work with ungloved hands. The Kinnepetoo Esquimaux who seldom build even the small fires of the native stone lamp in their *igloos* during the very coldest weather of winter, are probably the hardiest of all these boreal tribes in withstanding low temperatures, and sit around in their cold cheerless snow-houses with only their undergarments on (the Esquimau has two suits of reindeer skins, the outer with the hair turned outward, and the inner with the hair turned toward, and resting against the body) their arms withdrawn from their sleeves and resting on their bare bodies across their breast, chatting all the while pleasantly about various matters, the thermometer often being below zero; in fact, the only warmth the snow-house has is that given off by their bodies. I have known one of these Kinnepetoos to take an undressed reindeer hide that had been soaked in water, to remove the hair, which was frozen stiff as a plate of boiler iron, put the same against his naked body, and not only hold it there till it was thawed out, but until it was perfectly dry, so as to use it for a drumhead (*Kee-low-tee*) in their peculiar savage rites. In fact, I might say that I have been naked myself in a temperature of minus sixty-eight degrees, during the short time it took to undress, roll my reindeer coat into a bundle for a pillow, and crawl into my sleeping-bag; but my movements partook more of the character of a small boy going to a base-ball match than one sawing wood.

Their most efficient method of keeping warm seems to be in the enormous quantities of fat they devour, and especially during the winter season, and of which so much has been written that I will leave the subject for others not so well understood. Their clothing made of reindeer skins throughout, I have sufficiently, though very briefly, described above in brackets. Persons looking at pictures of polar people clad in these swarthy furs, think from their bulky appearance that they must be quite heavy, but I think they are lighter than our winter suits at home. They are certainly lighter than any other clothing in the world called upon to protect their owners from such intense cold.

A most peculiar fallacy of Esquimaux winter life is that, when they are living in these odd little snow houses, and wrapped in furs and subsisting on fats, that their lives are a sort of hibernation, as near as human beings can be supposed to hibernate. On the contrary, the very reverse seems to be the case, and it is by far their liveliest season, despite the fact that their days are much shorter, and all conditions, as we would view them, much more unfavorable for any great amount of active out-of-door-life. I do not believe I exaggerate when I say, that for every mile they travel in summer, with their *kiaks* (little skin canoes), or on foot over the land, they can show from a dozen to a score in the winter with their dogs and sledges. They kill more game in this season, and their long evenings are by far the most lively in their acrobatic and superstitious exercises.

A book could be written without exhausting the winter life in Esquimaux land, but I have tried, in my small space, to give some of the most interesting themes thereon, and above all something new and beyond the hackneyed subjects of other polar travelers.

THE STREAMS OF WESTERN KANSAS.

An inspection of the map of Kansas discloses the fact that the streams of the western part of the State are divisable into two systems. These are the northern, or Kansas river system, and the southern, or Arkansas river system. They are separated by a somewhat irregular line whose general course is east and west through the middle of the State.

Of the branches of the northern system, the Republican, the most northern branch, is a far larger stream than either the Solomon, the Saline or the Smoky. The most important of the smaller tributary streams of the north are also in the Republican region.

Of the southern system, the Arkansas river, after crossing the west line of the State, flows for about one hundred and fifty miles without a single living tributary, and, until after passing the middle of the State, it receives only three small streams, viz: Coon Creek, Pawnee Creek and Walnut Creek. Along the Indian Territory line, Western Kansas is drained by the Cimarron, a branch of the Arkansas, and its tributaries. The great number of these tributaries becomes strikingly noticeable about the one hundredth meridian, or the longitude of Dodge City; and from this east, the streams indicate an abundant water supply in our southern counties.

This distribution of the streams of Kansas leads naturally to the inference, if the inquiry be carried no farther, that the northern and southern portions of the western half of the State have better supplies of water than are accorded to the central belt.

An examination of the characteristics of the water courses, and of the country they traverse, renders questionable the correctness of this assumption.

Turning to the streams of the southern system (I have not yet extended the inquiry minutely to the northern system), the Arkansas river may be taken as somewhat typical. It is a broad river, whose banks are from three to eight feet high, and whose waters run rapidly over and through a bed of course sand and gravel, the particles of which mix and roll with the muddy water. Where it leaves the Rocky Mountains, the Arkansas is a rushing torrent, which at all seasons discharges a considerable volume of water. Its fall in Kansas is from six to eight feet to the mile. Its course is nearly east until near the midde of the State, and then it is southeast. The depth of its gravelly bed is not known. Borings have been made at Sterling to a depth of about fifty feet, and it was found that the gravel became coarser as the boring proceeded; and at about fifty feet below the river-bed the sand-pump failed to work, being unable to receive and hold the coarse sand.

Throughout the Arkansas river valley, wells sunk to the level of the river bed reach the same character of gravel and an inexhaustible supply of water. When the Atchison, Topeka & Santa Fe Railroad track was laid along the upper Arkansas valley, the working force consisted of about three hundred men and two hundred and fifty horses. Camp was made at noon, and at night. The supply of water for these men and horses was obtained by driving down at the successive camping places a small gas pipe with a perforated point, and attaching a pump to the top. The depth from the road-bed to the water was, in most places, about six feet. The abundance of this water supply is further illustrated by the pumps of the sugar works at Sterling and Hutchison. The amount of water required for condensing the vapor from the vacuum pans is immense, and is supplied by powerful steam-pumps, working continuously day and night. The water raised by one such pump is about what would flow through a four-inch circular orifice under a head of one foot. To obtain this supply, a few perforated points are driven into the gravel and water beneath the soil, and connected with the suction-pipe of the pump; and they never fail to furnish an abundance of water.

In the southwestern counties, the country rises into an elevated table-land at varying distances from the Arkansas river. Wells are made in these high plains, by boring, as it is believed, to a level with the bed of the river, where gravel or sand and water are encountered very much as at a less depth in the valley. These borings reach the water in the country southwest of Dodge at a depth of about one hundred and ten feet. Exceptional places are found in which water has not been reached at a depth even of two hundred and fifty feet. In these places, a dry clay, impervious to water, is encountered. Some wells have been bored through this clay, in which cases the water has risen to within one hundred and fifty feet of the surface. The question now arises. Does the Arkansas flow under the entire southwestern quarter of Kansas.

Now turn to the Cimarron river, two branches of which enter the State near the southwestern corner, and unite a short distance west of one hundred and first meridian. After uniting they disappear beneath the surface, and are seen no more for fifteen or twenty miles, and then reappear a larger stream than when they sunk away. In times of freshet the overground stream is continuous over all parts of its course.

Another stream, called by the old plainsmen White-woman Creek, enters the State in Greeley county, crosses Greeley and Wichita, and disappears about the middle of Scott county. It is stated that this stream flows over the surface during only a portion of the year. At no time, however, has it any visible outlet; unless, indeed, it may be considered the headwater of Walnut creek, which rises, an unfailing stream, in Lane, the county next east of that in which the White-woman disappears.

Other less conspicuous examples of disappearance of streams might be noted. Indeed the Arkansas itself has, in the central part of the State, several times, within the observation of the writer, become, to all appearance, a bed of dry and drifting sand. But an abundance of water was always found at a short distance below the surface.

It is stated that from the time Texas cattle were first driven over the trail to Dodge City, the coy-boys experienced difficulty in preventing stampedes at a point in the southern part of Ford county. Rumbling noises even are reported to have startled the bold cow-boys themselves. Subsequently, it is stated that a circular portion of earth, variously estimated at one hundred and fifty to three hundred feet in diameter, sunk, leaving a great hole down to the water's level, about one hundred feet below the surface. The water is intensely salty; and an enterprising settler has erected a windmill, and is pumping the salt water into troughs, from which the sun and wind carry away the water, allowing the salt to crystallize. Further east salt-springs and salt-streams become numerous; and in the Indian Territory, not far south of the Kansas line, are great salt plains of the Cimarron river. No direct investigation has yet been made to determine the existence of a current of water under this vast country. But every inquiry lends confirmation to the belief that a large portion of the moisture precipitated upon the eastern slope of the Rocky Mountains, together with that of the plains themselves, finds its way quickly through the porous soil to this preamble gravel, and through this proceeds slowly in a broad, deep stream under the plains of Kansas. And before concluding that the middle belt of the western half of the State receives less rainfall than the country north and south of it, it will be well to compare the extremely open soils of the middle with those of the other parts; to make some geological comparisons; to ascertain whether the streams of the north and south may not be the springs fed by the rains of the middle portion; and, finally, to compare records of rainfall, when such records shall have been made.—*Prof. Cowgill.*

PNEUMONIA AND OZONE.

Since the beginning of this year there has been a severe and very fatal epiedmic of pneumonia in this city, from which many of our most eminent citizens have died. Several of the leading physicians have stated that the deathrate from pneumonia this year has been much larger than that of the cholera in the year 1854.

As so much solicitude has been felt and expressed by the doctors and by the public at this sudden increase of death from pneumonia, I have thought that it was desirable to undertake a systematic study of the bearing of meteorology upon it, and see if there could be detected any connection between the weather and this disease in the city of New York. On comparing many thousands of observations from the self-recording barometer, thermometers (dry, wet, and sun), hygrometer, anemometers, and pluviometer, with the mortuary statistics, there could not be found any continuous connection between these observations and the prevalence of pneumonia. But when ozone was taken into consideration, there was found to be a very close connection between its observations and the deathrate from this disease.

In the following table is given a summary of the deaths from pneumonia, the amount of ozone, and the number of days on which ozone occurred for the months of January, February, March, April and May for each year from 1878 to 1885 for the city of New York:

YEARS.	DEATHS.	OZONE.	NO. OF DAYS.
1878	1304	9.50	73
1879	1409	10.88	65
1880	1490	12.39	75
1881	1804	12.84	101
1882	2056	16.19	86
1883	2061	12.73	85
1884	1608	6.45	48
1885	2308	13.26	87

On an inspection of this table, it will be found that by the records of the Health Department of New York City there were for the first five months in the year 1878, 1304 deaths from pneumonia, while the observations at this observatory give 9.50 for ozone on 73 days for the same months. In 1882 the deathrate had increased to 2056 deaths, and the ozone to 16.19 on 86 days. In 1884 there was a decrease in the deathrate to

1608, and also in the ozone to 6.45 on 48 days. In 1885 the deathrate from pneumonia increased to 2308; the ozone had also increased to 13.26 on 87 days.

Having studied the observations thus far, the two following questions appeal to our attention.

(1) *What is ozone?* (2) *Can ozone produce pneumonia?*

For more than half a century scientists have been endeavoring to answer the first question. Some of them have called it "electricized oxygen," "allotropic oxygen," "active oxygen," "excited oxygen." Berzelius expressed the opinion that ozone was oxygen in a peculiar state. Becquerel demonstrated that oxygen may be converted into ozone by the prolonged action of electricity. By a majority of modern experimenters it has been admitted that ozone is an allotropic condition of oxygen, similar to that which may be assured by chlorine, as was shown by my father, the late Prof. John William Draper, M. D., of the New York University, and an account of which was published by him in a memoir entitled, "*Allotropism of Chlorine, or its passive and active states*," in the year 1845. Ozone like Chlorine possesses powerful bleaching, disinfecting, and deodorizing qualities, and in a concentrated form both these gases are very destructive to animal life. According to Schonbein, oxygen is capable of assuming three different conditions, viz:—two contrary active states, and one passive. These have been named respectively ozone, antozone, and neutral oxygen. But why oxygen should assume its active or passive states little is known. My father found that the indigo rays of the solar spectrum could produce in chlorine the active condition. May not these same rays produce the corresponding state in oxygen?

In taking daily observations on ozone at this observatory, Schonbein's iodide of potassium and starch papers have been used, and also the iodide of calcium and starch papers. I have noticed that on some occasions, soon after the papers have been exposed to the atmosphere they change to a decided brown color, while after a few hours this brown color nearly disappears. On dipping the paper while still brown into water, the blue color of iodide of starch is given. This shows that antozone has been present in the atmosphere but has not had time to destroy entirely the ozone effects produced on the paper.

We come now to the consideration of the 2nd question, viz:

Can ozone produce pneumonia?

As to the causes of this disease, very little is known. Sometimes no cause at all can be traced. Very often it is supposed to be the consequence of exposure to cold, especially when the body has been previously heated by exercise. But why such exposure should in one person cause pneumonia, in a second, pleurisy, in a third pericarditis, and in a fourth, peritonitis we cannot tell.

If, as we have seen in considering the first question, oxygen has the power of assuming different forms, one of them preservative, another destructive, may it not in one or other of these forms produce inflamation of the substance of the lungs, etc., thereby causing their engorgement with blood not properly arterialized? I think it might be well for physicians in their treatment of pneumonia, or its allied diseases to consider whether these diseases may not be due to ozone or antozone, and whether it may not be possible to neutralize the evil effects of one form of oxygen, by the use of the other. The further question arises whether the administration of pure oxygen to patients may not be the very worst treatment. It is well known that the oxygen of the atmosphere is mixed with about four-fifths of nitrogen.

I regret to see that so many meteorologists neglect the taking of ozone observations, because they are not satisfied with the results obtained. I think that the day is not far distant when we shall know the exact influence of ozone upon disease, and if it should be discovered that in other cities, there is the same connection between ozone and the deathrate from pneumonia, and its allied diseases, as there seems to have been in this city for the past eight years, shall we not have made the first necessary step towards mitigating the evil results of this disease upon human life, as well as its disastrous effect upon cattle under the form of pleuro-pneumonia.

CONCERNING CLUBS.*

A club was man's first weapon. The stout cudgel with which the primitive man killed a bear for his dinner was not more essential to his existence, than was that association with his fellow savages by which he secured protection and support.

And, as States matured and became well organized, such associations, for the promotion of some common object, multiplied and broadened their sway, until they have at last found recognition as important factors of human progress.

In no way, perhaps, is our age more distinguished from those that are past, than by its higher appreciation and wider application of this principle of association.

So far has the work of organization and subdivision been carried, that there is no place without its clubs, and no work that is not done, or attempted by them.

Under high conditions the club becomes mainly social and intellectual in its character and aims.

An example of such a club, and a most beautiful one, is found among the ancient Greeks. Imagine the rapture of a noble Athenian boy when admitted to his first symposium. How proud is his step; how glow his cheeks; how throb his pulses; how flames his ambition to acquit himself worthily. One could willingly be counted 2,500 years old next birthday to have shared his transports.

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*A paper read before the Social Science Club of Kansas and Western Missouri.

In the Greek symposium the young student or statesman was met by questions that challenged his reason and sharpened his wit.

The rising poet and painter and philosopher were encouraged there to present each his best work or thought; and criticism, keen but kind, prepared him for contact with the world. There wit more sparkled than wine; and odes of Sappho, and ballads of Anacreon, the sweet-voiced lyre and sweet-eyed musicians, filled and thrilled the young heart with poetic fervor. Dainty viands and rare perfumes, and softened radiance of light and color, less than glorious paintings and perfect statues, warmed the imagination and entranced the senses. There the beauty of lofty thoughts, and the sublimity of great deeds fired the eager youth to highest endeavor.

Since those ambrosial days, the club has assumed all phases. The French Academy, at its palmiest, when only a back parlor circle of literary friends, and before it had to bear the oppressive honor of Richelieu's patronage, was the very perfection of a social and intellectual club. The conversational power and grace; the swift, keen wit; the perfect dignity and discipline, combined with sweetness and polished familiarity with which its half dozen members entertained each other, have since enchanted the whole world, and have constituted it an ideal to be longingly followed, if never quite attained.

In London, "The Club," as it was invariably called,—for its members would not stop to identify it by any distinctive title—the haunt of Johnson and Goldsmith, of Garrick, and Gibbon, and Sir Joshua Reynolds, was famous—how justly so, we all know. But it lacked that spirit and refinement which the presence of cultivated and gifted women alone can bestow. That it was denied their gracious influence, and that all clubs, after this time, gravitated toward social and even animal enjoyment, to the neglect of the intellectual, was a misfortune for which Johnson must bear somewhat of blame.

"A club," said Johnson, "is an assembly of good fellows meeting under certain conditions." And other good fellows, accepting this vague definition, allowed the conditions to become more and more uncertain, until good-fellowship was the only point left worth insisting upon.

Of the fifty and more clubs which sprang up in London about this time, those where good things were said—not merely swallowed—became exceedingly rare.

These were all gentlemen's clubs, in the sense that no ladies were admitted, and had their fitting place in coffee houses and taverns. Such of them as are still extant, have improved in many ways. These occupy imposing buildings, and possess every convenience and luxury of a perfectly appointed home, including valuable libraries.

Clubs after this model are found in all our larger cities; but they have never become quite popular.

The American gentleman is more domestic than the English, and not so culpable.

In so far as these, or any clubs, undertake to furnish amusement for men or women, apart from their families, and from each other, and to fill up those leisure hours which should be given to the home, they aim a blow directly at the unity of the family, and are vicious in their tendencies. But these tendencies are so remote from us as scarcely to merit a passing allusion.

Among us, intellectual society inclines to the formation of study clubs, that is, of regularly organized companies, meeting at stated times, for associated study and criticism. These study clubs, though never so sharply defined but that each shows a shading of the other, and many show a blending throughout, are yet clearly divided, by the dominant motive, into two types. In clubs of the first type, the main object is individual culture; in those of the second, it is public improvement.

An association of the first type, and one that is almost purely individual in its work, is the "Society to Encourage Study at Home," or the "Boston Home Course." The name of this woman's club expresses its aim. It wishes to supersede desultory reading with systematic study; to give to girls and woman an opportunity to complete at home an unfinished education. And it offers them a course of instruction which is broad and deep, as well as elegant. The monthly examinations, conducted by correspondence, are critical, and even severe; but these are accompanied by suggestions so full of kindness and wisdom that the student is encouraged to persevere.

This Boston home course begins its thirteenth year with widening influence, and with increased opportunities for doing good. More than 200 teachers are engaged in the work, all volunteers; and its students found in every state in the union, number many hundreds. Not less than 12,000 letters pass between these teachers and pupils every year. The club possesses an extensive loan library, also, to which additions are canstantly being made.

One other good thing it does; it sends to each student a health tract —preaching the responsibility of woman, not only for their own health, but for the health of the home, and encouraging household work as a proper balance to intellectual work.

The Chautauqua movement, with its classes of 800 in Japan, its branches in South Africa, and its circles in every city and hamlet of our country—is phenomenal. One hundred thousand students are, this year, counted in its ranks, and more than 1,000 have already graduated. Nothing could be more significant of the widespread appetite for culture than such a success for such an enterprise. It is one of the most promising signs of the times, one of the strongest of many hints of the democratic tendency of learning, and of the insufficiency of the old time methods of college and university to teach the masses.

The Chautauqua course of study has been much criticised; it has been called superficial and pretentious; and is charged with making literary upstarts rather than hard workers and deep thinkers. And some of its text books are perhaps compilations suited for hasty rather than thorough work. But to the multitudes who must do hasty work or none at all, it gives that outline acquaintance with the world of letters and the wonders of science which makes them at least appreciative readers and listeners. Much smattering, it may be argued, is far beneath a little real education. But among the ever increasing myriads of things which it were good to know, we sometimes feel like admitting, with Gail Hamilton, that we would be thankful to be "well smattered."

It is undoubtedly true, also, that many who would hesitate to attempt a more exacting course, acquire, by means of this, a taste for knowledge which ultimately leads them into deeper study. The *Chautauqua Press*, of Boston, is constantly issuing works prepared expressly to meet the wants of the club; and its late productions—notably those in the departments of literature and natural science—show marked improvement. Its late appointments, also, show its more liberal tendency and the great Chautauqua flood, as it grows wider and deeper, is submerging its old narrow land marks, and sweeping away old superstitions.

The smaller study clubs which everywhere abound, and in which many of us are personally interested, are all of this first type,—being chiefly concerned with the intellectual pleasures and advancement of their individual members.

The Concord school of philosophy—a study club, in a wide sense—should be, it would seem, a perfect example of the first type, since its aim is purely philosophical.

But speculative philosophy gasps for breath in the material atmosphere of the nineteenth century; and the modern school of Athens, with Emerson as its Socrates—Emerson, "the fire of whose genius was love for humanity," finds that it is philosophy as applied to the problems of life, that compels its profoundest research.

If it would found an American school of philosophy, it must make that philosophy practical; it must be the doctrine of life, the art of living nobly and well. It must send to the nursery better mothers; to the schools and colleges better teachers; to the government offices better statesmen; and to the pulpit better interpreters of the sacred book.

This is its declared purpose, and to it we all respond, amen! and may the seven years of our Concord school of philosophy be prolonged to seventy times seven.

Sorosis, the pioneer woman's club of America,—17 years old last March—had, as its first and only ostensible object, the promotion of useful and pleasent relations between women of literary tastes. But those brave, earnest, strong-souled and strong-minded women, who made the early Sorosis what it was,—Frances Power Cobb, Alice and Phœbe Carey, Emily Faithful, Lucretia Mott, and others possessed a gift of helpfulness which mortgaged them to all humanity.

There was healing in the hem of their garments; the multitudes pressed upon them, and would not be kept back. Their own large-heartedness, also, forced them to supplement more purely literary work with the discussion of the proper field for work for women; the best way to aid women; plans for labor schools; the moral, as well as mental education of girls; homes for unfortunate women; foundling hospitals, and hosts of kindred subjects. These discussions opened the way to wider fields of usefulness, and to a higher, grander womanhood for the whole sex.

The organizations claiming Sorosis as their parent are many and helpful. And we, who are here to-day, have somewhat for which to thank Sorosis, in that we, as women, are growing stronger, braver, freer, more noble, more patient, and more womanly.

The second type—the club whose aim is wholly beneficent—has many glorious representatives. They are devoted to the discussion of subjects of the first importance—political, economic, social, ethical and philanthropic, and represent the most earnest, thoughtful, and progressive element of our age and country.

Such is the American Social Science association, which this year celebrated its twentieth birthday. Among the members of this great club, are many who are workers also in one or more of the associations already mentioned—men and women whose names are household words to us; and many others who have done valiant work in its ranks, have gone beyond. One of its earliest members was General Grant; that good citizen, who hated the deadly art by which he rose to fame; who sought neither dominion nor glory, but peace alone, and the welfare of mankind. The introduction of definite instruction in the social sciences into so many American colleges and universities is directly due to the efforts of this association. At Williams college, at the University of Michigan, at Harvard and Cornell social studies are being pursued with surprising zeal and thoroughness. This is matter for rejoicing to all who realize how vital is the necessity that the studies of our young men and women should bear more strongly on the problems of American life.

The American Social Science association, with its many branches, the Society for Ethical Culture with its many branches, and kindred organizations which are springing up everywhere, down to our own Social Science club of Kansas and western Missouri, which, if it has not many branches, has many and deep roots, these form one band of workers, hand-fasted in a common cause—the good of humanity—setting themselves to study the facts and laws of the social order without prejudice or bias of any sort; aiming ever at the prevention of evil, rather than at its cure; striving patiently to learn what is, and to promote what ought to be.

In our strong, forth-putting, irrepressible, young American life, where bold and bolder investigations are constantly being made in every department of knowledge, new social and moral problems are every day confronting us.

Crime and the treatment of criminals, pauperism and practical charity, the elevation of the working classes, temperance, sanitary science, the adulteration of food, work and women, the just relation of the sexes, duties of parents and children, these, and other questions are pressing for answers.

It may be that our club stands at the foot, the youngest and weakest member of the great national class in the science of society; but not for this reason shall we escape our share of the responsibility. Many of the questions are peculiarly our province because we are women, and it is our sisters who ask. We must answer the young mother who sits at home, rocking her babe upon her breast, and turning wide, glad eyes to us for guidance. And that other mother whose streaming eyes and shaking hands implore our aid in winning back a wayward one. There are vaguely dissatisfied souls—useless, but yearning to be of use—to be turned into paths of unselfish helpfulness, and everywhere, discordant hearts to be attuned to harmony, and inspired with a loving enthusiasm for all that is good, and true, and beautiful. For our encouragement, we may remind each other of the successes of other women. The recent Woman's Congress at Des Moines, and the Woman's suffrage association at Minneapolis, have breathed inspiration through the whole country. And, at the anniversary of the American Social Science association, the most salient and incisive discourses, those that awakened the deepest interest and most thorough discussion, were given by our clear-headed, great-hearted, public-spirited women. God bless them!

Since these discussions are forced upon us, how best can the work be done?

First of all, by keeping ourselves as a club in the best running order.

We possess one requisite of success

in that we began small, and have attained to our present proportions by a natural growth. A rapid growth, truly, from the original twenty to the present 375 members, in the four and a half years of our existence, but still a growth that is vigorous and healthy. Another promise of success is that we are perfect in harmony; and still another that we appreciate the importance of the work before us, and are earnest to give our best selves to its accomplishment.

Every member is here responsible, not only for the assigned duty, but for the general harmony and interest. A full realization of this responsibility fosters enthusiasm, without which there is no grand success.

It were well if we were content to make haste slowly. Better for us, surely, is one subject carefully presented and thoroughly discussed, than a passing glance at many. We praise this paper, and that, as "so suggestive;" but what use do we make of these good suggestions? Theoretically we go home with our tablets full of them; theoretically we study them all toilfully, and apply them all conscientiously. Practically they are dropped, with a sigh, into the great mental waste basket where all good suggestions go. We are everywhere haunted with the reproachful ghosts of good suggestions; and must we here increase that grisley throng? Why not do the little that we can, thoroughly and well? that we may carry away, not the shadow, but the substance of things hoped for.

A high sense of honor requires, in a club, a deep subsoil cultivation, that its early-ripe fruit may be a fine scorn for anything like the shirking of a responsibility, great or small. One woman possessed of inflexible integrity and reliability is of more value than many geniuses. All may not realize the power of those homely, old fashioned virtues, patience, perseverence, and promptitude; but, verily, the executive committee knoweth that their price is above rubies.

A degree of moral hardihood is also a goodly possession, so much as suffices to the utterance of any honest thought. Also a little—just a little—callousness to criticism.

We may have confidence, always, to speak our best thoughts. It is a God that dwells within, and all should do it reverence. Reticence is a thing to learn as well as eloquence. After reticence, comes calmness, and patience, and tact, and unfailing kindness. Also, respect for individuality, sympathy with all honest endeavor, however crude; and triumph in each other's success.

Such clubs as ours, are, as they should be, free from all thought of caste. It is not to be believed that the accident of position ever affected the status of any one here, where all meet with a common interest in the common good.

Many a soul, shut in by circumstances, or by its own sensitiveness, longs for such sympathy and companionship as we here enjoy. If our club does in any measure broaden and sweeten life for one of these, or if it sends one weary soul upon its way, once more glad, and strong, and patient, it has given a fair excuse for being.

Finally, let us begin and end with faith—faith in ourselves, faith in each other, and faith in the advancing, wide-sweeping, uplifting wave of a better civilization.

So shall we study the science of society with the earnestness of hearts consecrated to the work; gaining ever a fuller appreciation of life and its duties, staunch ever to the fealty that we owe to each other, to our sex, and to the world; growing ever into a closer sisterhood, and a more perfect womanhood.

EDITORIAL.

CONTEMPORARY FICTION.

The literature of our day is something entirely *sui generis*. The historian, the biographer, the essayist, even the poet, as well as more didactic publicists, write for an audience very different in education and in activities from that addressed by writers of the last, or even of the first part of this, generation. Historians must present something else besides chronicles of battles, policies and national achievements; they must display a knowledge of the social forces which underlie events and be prepared to square their speculations with the generalizations of modern science. It is the same with the others. What is it that gave Tennyson's "In Memoriam" such triumphant popularity? Obviously, as a mere elegy, it would have dropped into the limbo that such poetry usually reaches and merits; but strung upon the light theme of private grief, like pearls upon a worthless thread, Tennyson presented the generalizations of science transfigured into poetry. Probably no essayist of the day surpasses Mathew Arnold in celebrity; but, despite the beauties of his style, the chief value of his productions lies in the fact that his ideas are in harmony with prevailing scientific views. As for political economists, social theorists, even homiletical writers, they must conform to the current of scientific opinion also, or else see their pages go back to the paper mills.

The chief requirement of the modern reading public (I mean the enlightened, informed public) is, that the books it is asked to read must have plot, theme, moral, all subservient to some phase of sociology, psychology or other scientific generalization. It cares little about the matters so dear to the hearts of our fathers.

It cannot be supposed that fiction would remain unaffected by a motive so universal in its influence. On the contrary, it is profoundly affected by it. The novels of George Elliot, of Henry James, of Alphonse Daudet, are not only different in degree, they are different in kind, from the novels of Dickens, of Hawthorne, of Victor Hugo. They are, as to these, what the comparative-anatomist is to the empirical physiologist, What does it matter whether the book ends with a marriage or not, whether or no vice is punished or virtue rewarded? The author knows that these features are adventitious, and, whatever he may conclude to do about them, the result of his work must stand the test of scientific appraisement.

Yet it does seem that style should not be entirely forgotten, that the charm of a refined and elevated rhetoric should not be entirely sacrificed to the supposed requirements of scientific precision. In truth our foremost writers of fiction are guilty, not alone of this fault but of one of much worse tendency in its effect upon the future of letters. This is euphuism—a rude, rustic fault that one would expect to see confined to the hastily prepared columns of the daily newspaper. As an instance, take the installment of "The Princess Casamassima, in the November *Atlantic*. One would scarcely expect to read the following from Henry James: "Peter Muniment took a match out of his pocket and lighted it on the sole of shoe; after which he *applied* it to a tallow candle which stood in a tin *receptacle* on the low mantle-shelf. This enabled Hyacinth to *perceive* a narrow bed, etc., etc. "Several months after Hyacinth had made the acquaintance of Paul Muniment, Millicent Henning *remarked* to him that it was high time he should take her to some place of amusement." * * "She tossed her head and *remarked*, that when a young lady had done" etc., etc. Of course the match was applied to the candle, if it was lighted—but what was the use of going this bold and round-about way to say that Peter Muniment lit a candle? Why, too, say *receptacle*? The receptacle might have been a tin cup or a tin can, or a tin pie-plate, and surely there was no need of mentioning the fact at all if the picture of the candle was to be left so confused in our minds. Why not say it was in a tin *candle-stick*? The word may be vulgar and common, but certainly not more so than *receptacle* seems to be as it is used. Why, again, should Hyacynth *perceive* so long as we have a verb to see? If Miss Henning had *said* the words put in her mouth instead of *remarking* them, no doubt they would have been quite as interesting and characteristic.

This fault seems to be deep-seated in Henry James' manner of writing—it is hardly a style; and it is a strong voucher of his strength and genius that, in spite of such a grave blemish, he has taken such an exalted position in the ranks of novelists. While he remains true to the painstaking, scientific method of constructing his stories, his writings would gain vastly in strength and beauty, if such school-boy phrases were omitted from his books.

A CRITIC CRITICIZED.

It is sometimes amusing to come across instances of misapplied wisdom —wisdom so oracular and consequential that we are reminded by it of the homiletic discourses of the learned and valiant Hudibras. An example of this kind of wisdom appears in an editorial in a late number of the *Popular Science Monthly* under the title "Party Government." The inspiring cause of this effort seems to have been a sentiment uttered by Senator Hawley, of Connecticut, during a recent address; this sentiment is as follows: "It would be a lamentable day indeed for this country, or any other enjoying a free government, when it could be said that there were no parties—that lovely time that some long for, when there should not be enough of moral or intellectual life among the people to get up a single difference of opinion upon political affairs."

At this the *Monthly* inflates its learned nostrils, curls its intellectual lip and wrinkles its superior brow with indignation. Agreement in truth, it cries, is the supreme end, and Senator Hawley must be a very wicked partisan, a vicious and selfish agitator, a grovelling office seeker and political adventurer, if he thinks political disagreement a useful factor in governing men!

Now what nonsense this is and how unjust the aspersions upon the motives of a man who is, beyond cavil, a pure and honest patriot. Who doubts that the end of honest discussion is truth? that is, relative truth. None but the most enthusiastic and self-satisfied sciolist will assert that a single principle in natural science is settled into an axiom; we can only say that the tendency of thought and experience is in a certain direction and, therefore, we believe *that* to be the direction toward which our investigations and theories must tend in search of truth. Whether or not there will ever be a time when the so-called generalizations of science shall no longer be attacked or defended, is a matter of speculation; what we do know is that every useful application of these generalizations must come through the fire and shock of discussion.

But the absurdity of expecting an utopian age for politics, when all discussion shall end and the whole community settle down into universal agreement on all questions of political science, is too palpable for argument. It will be a millenium indeed when the lion of republicanism shall lie down with the lamb of democracy, and all the other *itions* and *isms* and *cracys* swallow each other, so that there shall be no more discussion, no more disagreement, no more change of opinion, no further increment to political knowledge.

If politics were a science at all it would be a science of expediency. What is expedience? must always be the prime question in politics. Whether the protectionist or the free-trader; the greenbacker or the specie-maniac; the monometalist or the bimetalist; all appeal alike to the selfish propensities of human nature. If these propensities were all governed by the same pursuits and passions, it might be possible to adjust them under one general principle; but so long as men's activities are directed into diverse and adverse channels, it is silly to dream of a time when one policy will suffice for a whole community, and men cease to wrangle over forms and policies of government.

This being so, the uses of conflict and discussion are manifest. What is expedient does not become palpable at first acquaintance. Indeed no other question is surrounded with more difficulties and perils. Even those who are most glib in formulating sociological doctrines are the least able to put successful schemes of government into operation; as witness the failure of John Locke with the Georgia colonists, and the more recent fiasco of Thomas Hughes in Tennessee—setting aside the Brook-farmers. There can be no cast-iron rules, no unchangeable regulations, because human society is never stationary, and every advance or retrogression, or change of aspect, must be taken account of in political science. This involves discussion. If it were possible to conceive of a state of human society so perfectly developed that no further change could occur,—a time when every individual will think and act precisely like every other individual—there would be also presented the spectacle of stagnation, decay and death.

Thus Mr. Hawley's sentiment, so far from branding him as an incendiary villain, thirsting for office and political triumph, really states a just and useful maxim. Whatever exceptions may be taken to the form of his statement, historical science places it beyond a doubt that discussion and progress walk hand in hand; while the closer mankind approaches to agreement on great subjects, we can confidently look for stagnation and dissolution. The Roman church, having the same opinion as the *Monthly*, sought to make all men of one opinion several centuries ago and the result was the Dark Ages. Let us hope that no such *doctrinaire* notions will ever again plunge civilization into a Slough of Despond so difficult to escape from.

A FEW OBSERVATIONS.

It is quite excusable in the promotor of a magazine, as it is in the projector of a railway, or a bank, or a barber-shop, to make public the testimonials and recognition his venture receives from those most capable of judging its merits. The REVIEW has certainly received its full share of praise and notice from press and public. Beginning with the London *Journal of Science*, our exchanges have vied with each other in the kindly rivalry of encouragement and good will. In the above mentioned periodical for November, there is a notice of the REVIEW, over two pages in length, presenting its merits and calling attention to the varied and interesting character of its contents. In another place the same magazine urges the people of *Kansas* not to let the REVIEW fail for want of patronage. This is all very pleasant coming from such a far-distant source, without friendship or self-interest to prompt it, and we hope the citizens of Kansas will profit by it.

Another very kind notice comes from Dr. Bowers, of the *Pacific Science Monthly* and *Ventura Free-Press* (California); another from the *Iron Trade Review;* another from the *Jefferson City Tribune;* another from the *Photographic Times;* all influential periodicals.

Prof. Otis T. Mason, in the *American Naturalist*, speaks of the REVIEW as "one of our best sources of information respecting the Archaeology of the Missouri region," and regrets very much to hear that there is danger of its discontinuance. Similar sentiments are expressed by Prof. Romyn Hitchcock of Washington, D. C., Prof. T. Berry Smith of Glasgow, Mo., Prof. Popenoe of Manhattan, Kas., Mr. C. E. Putnam of Davenport, Io., (Prest. Acad. of Sc.) and many other eminent authors and scientists.

Perhaps one of the most cordial endorsements the REVIEW has received, appeared in a recent number of the *Missouri School Journal*, an admirable and ably conducted paper; for the REVIEW is commended by it as "one of the best magazines published." This endorsement is doubly grateful on account of the high standing of the *Journal* and its freedom from the vice of awarding honor when it is not due.

The editorial head is far from being turned, however, by these evidences of his success. The gratification of personal vanity is very poor pay for the labors and expense of publishing a magazine of the size and pretensions of the REVIEW; and while this moral support is pleasant to the heart it is unsatisfying to the pocket-book.

During the ensuing year, we intend to keep the REVIEW up to its present standard at least, If it is possible to increase its sphere of usefulness and interest we will do so. If it has to die it shall go down with colors flying and not meanly dwindle into insignificance.

NOTA BENE.

The patrons of the REVIEW, are respectfully requested to send in the amount of their subscriptions to the present volume, (Vol. IX), that is, those who have not done so. It is requisite that this should be done early, as the publication of a magazine in Kansas City is not, *per se*, a means of gaining an independent fortune. Once for all we must confess that if our object in continuing the REVIEW had been a mercenary one, there would be little encouragement to go on with the work. This however, was not the object. We desired to keep alive an enterprise which will grow, with increase of time and growth of public spirit, into something admirable enough to deserve financial, as well as moral support. Of the latter it has had full measure—in fact there is scarcely a day that does not bring letters commending the REVIEW, and urging us not to weary in well doing.

We do not wish to gather laurels or gold in the endeavor, but while we devote much time and toil in the venture, it is only fair that the public should help us by subscribing for the REVIEW. We will vouch to parents that its contents will be more interesting and valuable to the young, than any book that can be purchased for the subscription price.

OUR religious exchanges are full of controversy over the aspect the church should present toward evolution. It seems that professors in several southern theological seminaries have been teaching doctrines closely approaching Darwinism and, in consequence, have found anything but "ways of pleasantness" and "paths of peace" among their respective brethren. Science and religion should be mutual helpers, and it is absurd in this age to keep up the world-old conflict between creeds and progress. Let us all admit that truth cannot suffer, in any event, by discussion, and that intolerance is the most formidable barrier between us and knowledge.

A SOCIETY for Psychical Research has been organized in Kansas City, of which Mr. James Scammon is president. The committees have been appointed and are engaged in pursuing the lines of investigation suggested by the experience of the various societies in England and the United States, formed during the past two years. It is also intimated that a Theosophical Society will soon be organized. Thus, Kansas City has at last been reached by the wave of Occultism.

CORRESPONDENCE.

EDITOR KANSAS CITY REVIEW:

Originality is not the vice that affects most writers. But in the Kansas City REVIEW for October and November, Mr. Nathan Kouns, has contradicted Herbert Spencer, in an article wonderfully original, both in manner and matter. He very strikingly declares that Augustine, Calvin and Spencer have committed the grave error of supposing that the law of cause and effect applies to the moral nature of man. The repetition of this old error by the last named gentleman, is much "more pitiable and inexcusable" than its original expression, because Spencer "seeks to bind moral or spiritual truths by physical laws." This is not merely original; it is admirably clear. Everybody knows at once what is meant by this statement. A physical law is a relation of co-existence—or it is a relation of sequence. Now, Mr. Kouns means to say that Mr. Spencer seeks to make a moral or a spiritual truth exist along with something else, or in consequence of the prior existence of something else. It is very "pitiable and inexcusable" in Mr. Spencer to seek to do this, and it is absurdly unscientific. It is true enough that when courts inquire into the commission of crime, they very foolishly regard the motive or cause of the act as quite important; but courts are not scientific. It is also true that all people in all ordinary judgments, about all sorts of actions, think that the impelling cause of the action determines its moral quality; but common men are not scientific. It is true that parents transmit to their children their passions, their weaknesses,their virtues, their moral and their intellectual characteristics, just as they transmit features, complexion and constitution; but parents are not scientific. It is true that the Hindoo is morally a Hindoo; that the Bushman is morally a Bushman; and that the enlightened European is morally on a very much higher plane than the Hindoo, who is on a much higher plane than the Bushman. But these are very unscientific facts, and therefore so much the worse for the facts. It is unscientific to hold that the European is broad minded and kind hearted, because of co-existences, or sequences in his surroundings, or to hold that the Bushman is a mean, degraded, cruel savage, because of his training, his ancestry or his surroundings. Moral characteristics do not depend on the laws of cause and effect, but on will, says the scientific Mr. Kouns. Calvin did not burn Servetus because his age and education had trained him to bigotry and intolerance,and the fact that nine-tenths of his contemporaries were not horror struck at the act, but regarded it as quite reasonable, is wholly unaccountable. The wills of those folks were fearfully perverted, but were entirely free. To inquire why they willed such bloody murders for religion's sake, is unscientific, "a pitiable and inexcusable error," "utterly unscientific."

Not only is Mr. Kouns wonderfully original in fundamental principles, but he is equally distinguished with a famous teacher of old, as one who "speaks with authority, and not as the Scribes and Pharisees." Columns of alleged facts disappear when Mr. Kouns announces that they are "utterly false in fact." It becomes "absolutely certain that the first necessary work of a soul when quickened by conjunction with a spirit, is to begin the work of erecting a natural body for itself" on the unsupported word of Mr. Kouns. By a statement it is settled that the original primitive faith of the ages when men used stone hatchets and dwelt in caves, "was a purer theism than any existing religion teaches." And this proposition being so scientifically established the conclusion is drawn that it must have been a "Divine Revelation." Originality crops out strongly in the nature of this primitive God of Mr. Kouns' construction. He was a dual God—a male and female God—a hermaphrodite God. And to keep up his originality to the end of the chapter the writer asserts "that the Revealed Religion was never designed for anything but the temporal salvation of mankind;" that it has not a word in it about "immortality," the life to come," or "a future state of rewards and punishments;" that it is "Faith plus Communism, the only true democracy." Verily we have a Prophet in our midst, and we will do well to hearken unto him. His message is such as never before was heard in this world, and it completely refutes the old law of Solomon, that there is nothing new under the sun. Here is news both to Agnostics, who do not know beyond experience, and to the innumerable sects who fill the churches of Buddha, Mohammed, and Christ with praise and prayer to their various Deity.

Yours Truly,
M. CAMPBELL.

SCIENTIFIC AND INDUSTRIAL NOTES.

THE KANSAS ACADEMY OF SCIENCE.

The Kansas Academy of Science has just closed a most successful meeting, both in the number and character of the papers read and in the number of visiting members present.

The first meeting of the Academy held at Manhattan was the fifth annual meeting, in 1872, the one just closed being the second held in this place. The members present at both meetings were few, but four being found. Three of those prominent at the meeting in 1872, General Fraser, then President of the Academy, and Professors Mudge and Bardwell, have since died; while others have long ago left the State. In spite of the loss of members by death or removal, the Academy gains rapidly by accessions from the ranks of young men, college students and others, till now it stands in the most prosperous stage of its existence, as evinced by the interest taken in the meetings by members and visitors. It is impossible to do justice to the programme of over forty titles within the limits of one article; and we shall not attempt to mention even all those of importance. The following are taken at random, as indicating the general scope and interest of the entire list of papers presented:—

The discovery of a fossil bird track in the

Dakota sandstone, by Prof. Snow, considerably extends the geological limits of bird life. The specimen is unmistakably a bird track, the peculiarities of the foot being shown distinctly in the impression, the relations of the several parts of the track precluding any other origin.

In his studies on rainfall in Kansas, Professor Lovewell finds that, in considering the records by five-year periods, some of these periods which occurred during the earlier years of the record, had a larger rainfall than any other period of later date. He considers the conclusion to the effect that the rainfall has been permanently increased, which some have drawn from Professor Snow's paper of last year, as being without sufficient foundation. It should be remembered, however, that Professor Snow claimed only that the record already made shows an excess of rainfall during the last half of the period over that of the first half, amounting to several inches per annum.

Mr. Knaus' observations upon the Cedar Bark Beetle, Phlœosinus dentatus Say, have a practical interest to every planter of the red cedar or the aborvitæ in Kansas. The range of this insect is considerable; but so far as observed, the species is not found in Kansas, save as introduced in cedar posts from Arkansas or Michigan. Its attacks upon trees in Kansas are found to be made chiefly in the vicinity of lumber yards, where, on investigation, the species is found, as stated, in imported cedar posts. Mr. Knaus records the presence of a parasitic ichneumon fly, which will doubtless tend to render the propagation and spread of the species less possible in our State.

In his paper, Professor Sayre discussed the subject of Digestive Ferments, giving especial attention to pepsin and pancreatin, —the nature of these substances and the method of their preparation. As to the nature of these principles, the author seemed to indicate that the more light there was thrown upon the subject, the more complicated it seemed. The further investigation of it unquestionably will be not only of scientific interest, but of great importance to medicine and suffering humanity.

Messrs. Willard and Failyer presented the description of a new extraction apparatus, devised by themselves, and showed a simple instrument made after their plans. The device gets its great recommendation in its greater simplicity, and in the absence of corks, wires, and other unmanageable attachments, and in the consequent greater ease of handling and greater precision of results.

Professor Lovewell's paper on Methods of Illustrating Wave Motion, and the paper upon some Lissajou's figures in three dimensions, by Messrs. Nichols and Franklin, describe, directly or incidentally, class-room apparatus of simple and cheap construction for the illustration of some interesting questions in physics.

The first evening was occupied by the retiring President, Dr. Brown, who discussed in both the scientific and the practical aspects, the subject of Natural Gas, its occurrence, and the methods of utilizing it. The second evening of the session was occupied by Professor Nichols, whose subject was the Magic Lantern. After describing the origin of the magic lantern, and its development from a mere toy of the conjuror to an instrument of wide usefulness in science, the lecturer showed its applications in the illustration of science by means of photographic slides, and by various chemical, magnetic and optical experiments.

The third evening of the session was given to a social gathering at the College, where the visiting and local members, aided by members of the College Faculty, discussed the practical side of the important topic, Science in the Kitchen, as presented by Mrs. Kedzie, the teacher of household economy, assisted by the young ladies of the fourth-year class.

The officers elected to serve for the ensuing year are: E. D. Nichols, President; J. D. Parker and N. S. Goss, Vice-Presidents; I. D. Graham, Treasurer; E. A. Popenoe, Secretary; F. W. Cragin, Librarian. In response to an invation by the Emporia members, that city was voted the place of next meeting, in November, 1886.—Prof. Popenoe, in Indust.

MOLDS.

All the forms of plant life—the yeast-plant, the protococcus, the diatoms and desmids and the bacteria—consist of single simple cells, and so are called unicellular plants. Now all plants, no matter how large they are when they have attained their full size, are, in the beginning, unicellular. It is by the repeated division and sub-division of this original cell that the full-grown plant is built up. As the cells go on multiplying in this way, they undergo differentiation—that is to say, they become separated into groups, each of which has special characters adapting it for a particular function in the life of the plant. Thus, some cells go to form the bark, others the wood-tissue, etc.

It will be interesting to take one of the simpler many-celled plants and trace out the stops of its growth from the time it consists of a single cell, to the time when it has attained its full growth, and is made up of many cells. Let us take for this purpose one of the molds, Penicillium glaucum. The molds, with the appearance of which to the naked eye as white or greenish patches forming on dead organic matter in damp places everybody is familiar, belong to the larger group of plants called fungi. The species of mold we are now to consider, may readily be cultivated for examination, by making a paste of flour and water, and allowing it to stand exposed to the air for a few days. The first appearance of the mold is a slight whitish opacity at the surface of the liquid, and close examination would show little elevations at these places. These patches rapidly extend, and become more opaque, and in three or four days take on a bluish-green look at the center. The whole mass now seems to float on the liquid. After a while it acquires a more decided green color, the coloring appearing first at the center and radiating outward. If now one blows upon it, a cloud of green dust will be seen; this dust is made up of spores.

Under the microscope, one of these spores is seen to be a spherical body, one three-thousandth of an inch in diameter, and consisting of a bit of fluid protoplasm, invested by a more dense and tough sac. If one of the spores that has fallen into the liquid paste be watched, a change in its appearance will soon be seen to occur. The spore grows larger, its liquid contents become granular, and in three or four hours there is protrusion of the cell-sac. This protrusion soon becomes an elongated process, and gives off branches from its sides. Just before the places of branching, cross-partitions are formed, and so the plant has now come to consist not of a single cell, but of several cells united. Meanwhile, other processes have been growing out from the spore and giving off branches, and after a time they become intertwined with one another and with those from other spores, and thus a delicate white film forms on the surface of the paste. This film is called a mycilium, and the separate branches of which it is made, hyphæ.

Examining a single one of these hyphæ, it will be seen that it is separated by cross-partitions into chambers. Each of these chambers constitutes a perfect cell; each consists of a liquid inner part and a surrounding tough, transparent envelope. Usually the inner part has four or five clear spots in it, called vacuoles.

For sometime all the hyphæ lie parallel to the surface, but after a while a few may be seen to hang down in the liquid. These are called submerged hyphæ. Soon after, other hyphæ grow up into the air, and it is then that the mold begins to take on its green color. These erect hyphæ are at first like the others, but by-and-by become modified. They give off branches both at their sides and ends. The latter, or terminal branches, next become pointed, and these points swell out into balls; the necks of the balls then enlongate, swell, and so form other balls, and this process is continued until a row of six or eight of them is produced. Now, each of these balls is a spore; as soon as it has become ripened, it falls from the hyphæ to the surface of the liquid, and gives rise to a new plant. Of course it often happens that a spore is carried off by a current of air, and the matter of its living or dying depend upon the kind of material upon which it chances to fall. If it falls upon some organic matter from which it can get food for its growth, it becomes a new plant; if not, it dies. That such spores float about in the air in great numbers is shown by the commonness of molds.

Another common mold, Mucor mucedo, has a life history different in some respects from the above, and sufficiently remarkable to deserve notice. This mold is quite large and the hyphæ can readily be seen with the naked eye; it commonly grows upon the fresh excrement of horses. In Mucor the ends of the erect hyphæ enlarge into single spherical box-like bodies within which the spores are contained. These boxes, or sporangia, when the spores are getting ripe, become covered with a thin coating of oxalate of lime, and at the same time the hyphæ lengthen out a great deal, and bend toward the light. Thus, after a while the sporangia strike against the surface from which the mold is growing, and its brittle covering bursts and allows the spores to escape.

Sometimes Mucor reproduces itself in a way still more remarkable. A couple of hyphæ come together at their tips swelling out as they approach each other. When they have come in contact, partitions form, cutting off the ends of each. The two ends then unite, forming a spherical body, and in it spores soon make their appearance. The body after a time becomes detached from the hyphæ and falls. After lying for six or seven weeks, the covering bursts through and the spores are diffused.

These two methods of generation occur alternately, and afford an example of the process called alternation of generations, and known of both animals and plants.—Cor. Country Gentleman.

VISIT TO MINES OF UNKNOWN PERIOD IN THE SERRO DE LAS CANAS.

Last Saturday, at 6 o'clock in the morning in company of Don Jesus Maria Chavez, the mining representative of this paper, behind a span of fast horses, took his departure for the old workings which are situated on the east side of the Rio Grande. At about 10 o'clock the base of the 500-foot and almost inaccessible cliff, upon the summit of which the old mines are situated, was reached. To ascend was by no means an easy task. However, after a half-hour's struggle the old shafts were in view. They were discovered in 1880 by Mr. Chaves, who while perambulating over this elevation, found his cane entering the soil in an unaccountable manner as he was leaning upon it. Upon examination he discovered that it had entered between two large rocks. Upon closer investigation he found that these large slabs covered the entrance to an opening beneath a dump in the vicinity, leading him to believe that an old abandoned mine lay beneath him. With some assistance he rolled away the obstacles, and upon exploring the shaft he found it to be about 70 feet deep, with a drift running to the east about 100 feet. As the roof has fallen in, numerous floors and many of the large chambers are filled with debris. It was found impossible to go further; but no doubt exists that these underground workings will be found to be of great magnitude when thoroughly explored. Just the reason why these shafts and drifts were excavated is hard to say, as no mineral is visible to the naked eye. Average rock of the crevice, however, is now being treated, and perhaps gold can be detected. Not the slightest vestige of European handicraft exists. A few fragments of indented and corrugated pottery upon the dump would indicate, however, that these properties were worked at a period anterior to the Spanish occupation of this territory, and are probably of that class of mines mentioned by Father Kino, the brave old priest and missionary, who in 1658 visited this land to evangelize the natives. In speaking of the miners of that period, he says: "They understand mining to some extent—not mere surface labor, but extracting the ore from the veins which they opened in solid rock, unearthing vast quantities of gold and silver, which they seemed to value only as it contributed to their comfort when made into articles of use or ornament." Not far from one of the shafts, a beer bottle containing a location by Daniel Lemons and Robert Howard was found, dated February 18, 1882. The formation in the vicinity consists of strata of lime, underneath which lies thin but numerous strata of red and grey sandstone. At the base of the eminence large deposits of sulphate of lime were found. The dump of the old workings afforded sulphate of lime, calcite and limestone, but no quartz. The entire absence of primitive metamorphic rock and all signs of copper, iron or lead, were manifest. The determination of the component parts of the specimens selected will be awaited with no small interest.—Socorro Bullion.

ANTHROPOLOGY.

The earliest travelers among the Indians mention mounds with buildings on the top of them covered with earth. In the mounds which I have examined, wherever burnt clay has been found more or less ashes occur underneath, and the impress of grass, sticks, cane or poles plainly reveals itself in the burnt clay. These vegetable substances were needed to support the earthen roof of the dwelling.

The dwellings of some modern Indians are built of poles, sticks and grass, covered thickly with mud. Upon the death of any of the inmates the house is burned down, and the framework consuming partly bakes the clay and leaves its impress therein. The Pimos and Maricopas of the Gila river, with all of the Indians of the Colorado river, build winter and summer dwellings. The former are hemispherical and mud-covered, the latter is an open mud-covered shed. When these are burned down at death, the clay is baked and appears like that dug from many mounds.

In many of the modern houses the earth is dug out in the center for a foot or more; this points to the reason for the pits found in the middle of mounds. Charred posts are found in mounds, the same phenomenon presents itself whenever a summer shed is consumed.

In examining the celebrated ruins of adobe and stone houses in Arizona, it is found that they were destroyed by fire, burnt clay with impressions of sticks and poles being found in them.

The examination of some mounds demonstrates the existence of buildings without clay covering. Now I have lately visited several Indian tribes who live in the hot season under sheds covered with thatch, with merely earth enough above to keep the twigs from blowing away. Now the burning down of such a shelter would leave only ashes and charcoal.

Again, both houses are on the outside the receptacle of everything which the Indians wish to keep out of harm's way, baskets, pottery, wattled granaries for corn, mezquit, etc. Now in some mounds I have found the pottery and other relics so curiously located as to leave little doubt in my mind of the burning of such a structure as I have just described.

The modern hut builder does not cover his consumed dwelling with a mound because the new arts taught by the white man and his new environment have taken away all necessity. Furthermore, the argument that the superior arts of the former Indians were associated with better houses for the artists is false. The finest works of modern art are produced in places no more elegant than the Pimo's summer shed.—Edward Palmer, in Am. Nat.

THE DAVENPORT ELEPHANT PIPES.

Mr. Charles E. Putnam, of Davenport, Iowa, has published a pamphlet of thirty-eight pages as a vindication of the authenticity of the elephant pipes and inscribed tablets in the museum of the Davenport Academy of Natural Sciences, from the accusations of the Bureau of Ethnology of the Smithsonian Institution. Those who have known the history of Davenport Academy, its struggles and triumphs for the love of pure science, and the extreme caution of its leading members, regretted that anything should appear in a Goverment publication reflecting upon their veracity or honesty. Tablets are common enough, being made of slate and other material and worn to-day by the present Indians of British Columbia and Alaska. So long as they do not contain outlandish and unclassifiable inscriptions there is nothing mysterious about them. On the contrary, the elephant pipes are mysterious. When I try to put the cast which we possess at the museum with something else, there is nothing to put with it. Professor Henry once said to one of his assistants who discovered an unclassifiable specimen: "That seems to stand out so unsociably that we must call it an 'outstanding phenomenon,' and wait patiently until something else turns up to go with it." The last word that should fall from the lips of a brother naturalist is "fraud."

On the other hand, barring this indiscretion, Henshaw is just what Major Powell says about him. He is a very careful and skillful naturalist. We should hail with delight the accession of all such men to the ranks of archæology because they bring light from every side to bear upon our mysteries. It should not make a particle of difference to any of us whether a pipe is the figure of a crow or of a toucan, so long as we know just what it represents. We may rest assured that for a long time every mystery solved will be accompanied by two quite as inexplicable.

But, really, too much account is being made of the matter. Squier and Davis are not overthrown. Their manatee, toucan and paraquet may be shot down by the ornithologist, but these practical gentlemen did not care a fig about such creatures. They made the greatest archæological survey and collections ever attempted in America, and their volume will indeed be a "monument" to their memory and to the glory of its authors for all time.

The Davenport Academy is not annihilated. Even if our theory should turn out true and the elephant pipe should prove a tapir pipe, and we should learn that tapirs once lived in the Mississippi valley, this grand association would survive.—O. T. Mason in Am. Nat.

THE SILVER QUESTION.

The following, from the Engineering and Mining Journal, states briefly the probable effect of the recent action of the Monetary Convention between the Latin Powers on the value of silver:

"France, Greece, Italy, and Switzerland have renewed the monetary convention for five years; silver coins redeemable in gold, no additional silver coinage permitted; convention open to Belgium."

This is the important announcement that comes to us by cable, and which is supplemented by a later dispatch, which says:

"The Monetary Convention between the Latin powers, providing for the suspension of the coinage of silver, permits each power to resume, provided the silver circulating in the other states is redeemed in gold by the resuming state."

In other words, the Latin Union has discarded bi-metalism and has agreed to redeem its present silver coinage in gold. Silver coinage will also be suspended, at least until the country has drawn into circulation the silver already coined. No more silver is to be coined for the present, and that already coined becomes, under this convention, simply a subsidiary coinage redeemable in gold. Belgium, which has been coining for many other countries, declines to redeem this coinage in gold, and consequently does not enter the Union. This action, in all probability, will lead to the adoption in this country of a policy similar to that of the Latin Union, for the redemption of silver in gold. It would be the purest folly for this country to continue coining silver beyond our needs, or of endeavoring alone to establish an arbitrary ratio between silver and gold.

This is the heaviest blow that the advocates of bi-metalism have received; but, no doubt, the step is necessary even in the interest of bi-metalism; for there is no prospect of England and Germany joining in the adoption of a standard ratio so long as some of the countries continue to buy and coin their silver, leaving them the gold. England, through India, has perhaps a greater interest than any other country in maintaining the value of silver, and it may be that the depreciation in silver that will probably follow this action of the Latin Union may lead to some united action looking to the establishment of a standard ratio between gold and silver. That such action will be taken is, certainly, not immediately probable; and for some time to come, the value of silver will be more than ever dependent on the demand for commercial uses outside of coinage requirements.

THE PHILOSOPHY OF VACCINATION.

Professor Tyndall explains the philosophy of vaccination as follows: "When a tree or a bundle of wheat or barley straw is burned, a certain amount of mineral matter remains in the ashes,—extremely small in comparison with the bulk of the tree or of the straw, but absolutely essential to its growth. In a soil lacking, or exhausted of, the necessary constituents, the tree cannot live, the crop cannot grow. Now, contagia are living things, which demand certain elements of life, just as inexorably as trees or wheat or barley; and it is not difficult to see that a crop of a given parasite may so far use up a constituent existing in small quantities in the body, but essential in the growth of the parasite, as to render the body unfit for the production of a second crop. The soil is exhausted; and, until the lost constituent is restored, the body is protected from any further attack from the same disorder. Such an explanation of non-recurrent diseases naturally presents itself to a thorough believer in the germ theory; and such was the solution which, in reply to a question, I ventured to offer nearly fifteen years ago to an eminent physician. To exhaust a soil, however, a parasite less vigorous and destructive than the really virulent one may suffice; and if, after having, by means of a feebler organism, exhausted the soil without fatal result, the most highly virulent parasite be introduced into the system, it will prove powerless. This, in the language of the germ theory, is the whole secret of vaccination."

THE PYROPHORE.

At a recent meeting of the Academy of Sciences, at Paris, a plate half filled with water, in which were half a dozen insects about an inch in length, which shone like diamonds, although the room was filled with sunshine, was passed around among the members. These insects had been brought from Mexico, where they are to be found in the forests. Their scientific name is the pyrophore; and, as none had ever been seen before in Europe, they created quite a sensation. The light resembles that of a glow-worm or a fire-fly, although as much more brilliant and intense as electric lamp surpasses a wax taper in its power of illumination. When the light begins to fade, it can be made as brilliant as before by shaking the insect, or dipping it in water. It is said the Indians of Mexico use them for a light at night, as a few will suffice to illuminate an entire room. When they are walking at night, they put one on each foot, so that they can be sure of their way, and also that they do not step upon any venomous snake or reptile with which the tropical forests abound. The Mexican ladies buy them from the Indians, and enclose them in a transparent bag, which they wear in their hair or at the neck. The effect is very beautiful, especially when several are worn; and, as the Indians sell them for a few cents a dozen, they are within the reach of every fair one. They are fed on sugar-cane, and, if well taken care of, will live a long time. One placed upon a page will enable it to be read with ease in the darkest night.

MONSTER SEA-TURTLE FOUND IN KANSAS.

The discoverer of a gigantic extinct sea-turtle found near Fort Wallace, in Western Kansas, first observed the large bony shields projecting from a bluff near Butte Creek.

They were carefully taken out and brought to Philadelphia, where the restoration was made. The fore-flippers alone were nearly five feet long, while its expanse from the tip of one extended flipper to another was about seventeen feet. The question may arise, how did this sea-turtle become buried in a bluff in the State of Kansas? A natural supposition would be that Kansas is the bed of a former ocean, and so it is. Ages ago, in what is called by geologists the Cretaceous Period, that part of the world was the bed of a great sea, in which the great turtle swam, together with other monsters of curious shape and appearance. Gradually the crust of the earth was raised, the water fell back, or became inclosed, and left the inhabitants of the Cretaceous Sea high and dry, to be covered by the earth and preserved for us to study ages afterward.

The shores of this ancient ocean are easily found and followed by geologists. Its extent has been traced on our Western plains by the bleaching and disintegrating remains that have been found, upon and beneath the surface.—Charles Frederick Holder, in St. Nicholas.

DIFFUSION PROCESS OF EXTRACTING BEET SUGAR.

At a late meeting of the Scientific Club at the Kansas Agricultural College Prof. Cowgill presented a paper on sugar-production, in which he sketched, briefly, the history of surgar-production and its various methods of manufacture. The most common sources of sugar are the tropical cane of the semitropical regions of North America, the sugar beet of France and adjacent countries, and the sorghum cane, which is an Asiatic plant, and was introduced from France into this country about thirty-two years ago, at which time it was hailed by abolitionists as a relief from the consumption of sugar produced by the slave labor. This produced a disappointment. It has been proved in France that the quantity of sugar found in the beet depends greatly upon the manner of cultivation; this is also true of sorghum. In the process of manufacture the following distinct processes are noted: extraction of the juices, cleansing of impurities, condensation of evaporation, crystallization, separation of crystals from syrup and refining. In the extraction of the juice by means of crushers, it is found that only about forty-five per cent. of the eighty-eight to ninety per cent. of juice in the weight of the cane is extracted. Or, in other words, only about one half of the juice is extracted. Besides this, the crushers break down the cell-walls in the cane and carry their substance into the juice, from which it cannot be removed. By the "diffusion" process, these objections are sought to be overcome by the cutting of the cane diagonally into chips of about one sixteenth to one eighth of an inch in thickness, and placing them in a tank which is divided into two compartments by a membrane, through which an osmose action can take place. The chips in one compartment are covered with water, and water placed on the other side of the membrane; and when, by diffusion, the liquids in both compartments attain the same consistency, a part of the juice has been extracted from the chips and held in solution on the water side of the membrane. This is drawn off and applied to fresh chips, and the process repeated until each measure of water has passed through six measures of chips, thus insuring about double the amount of juice extracted, and at a less cost than by means of the crusher.

A SUGGESTION THAT MAY PROVE OF VALUE.

Some one, reasoning on the hypothesis that organic life is only able to resist its destruction by the ordinary law of nature through the constant change of bulk and form of its body, has advanced a suggestion which may prove fruitful in these days of vivisection. When it is desirable to prolong the life of a plant, some parts are cut off from it or another body fastened to it, or vice versa; and of this sort of treatment for the promotion of longevity in the vegetable kingdom a most notable and successful instance is incidently cited—the rose bush, now nearly a thousand years old, which is trained on the wall of a church in Hildesheim. Further—accepting as true the proposition that in the animal kingdom those creatures which by some means are able to change the bulk or form of their bodies live longer than those that cannot do so—our author ventures the belief that we may lengthen human life by removing morbid matter at certain intervals, or by altering the form of the body!

A HUGE BRIDGE.

The project of a tunnel under the Straits of Messina, to connect Sicily with Italy, is an enterprise which has long received the attention of engineers and been recommended by scientific experts. Recently, however, a Piedmontese company has come forward with a counter project for a bridge, an enterprise which, it is remarked, will, if ever carried out, constitute as remarkable a work of the kind as there is in the world. According to the published statement, the width of the strait at its narrowest point is about two miles, but, owing to the great depth of the water—more than 500 feet—on this line, the projectors propose to locate the bridge where it would have a length of about two miles and a half. The plan of this gigantic structure involves four piers, connected by spans of five-eighths of a mile in length, the two shore arches having half the span of the three central ones.—Electrical Review.

THE KINETIC THEORY OF GASES.

The modern kinetic theory of gases, says Prof. Tait, in offeriug a suggestion as to the source of atmospheric electricity, shows that the particles of water vapor are so small that there are somewhere about three hundred millions of millions (a truly vast number) of them in a single cubic inch of saturated steam at ordinary atmospheric pressure. This corresponds to 1-1600 or so of a cubic inch of water, i. e., to about an average raindrop. But if each of the vapor particles had been by any cause electrified to one and the same potential, and all could be made to unite, the potential of the raindrop formed from them would be fifty million times greater. Thus it appears that if there be any cause which would give each particle of vapor an electric potential, even if that potential were smaller than any that can be indicated by most delicate electrometers, the aggregation of these particles into raindrops would easily explain the most formidable thunder cloud.

GETTING THE TASTE OF MUTTON.

A queer story comes from New Zealand. The owls in that island used to be harmless as doves; indeed, they were once "mousing owls," and, therefore, useful. But one night a settler left a sheepskin nailed to his roof, and an owl came along and tasted o the fat mutton left thereon. That owl became a sheep killer, alighting on a sheep back three nights later. Still more strange all the other owls began to like mutton, an now the New Zealand bird of that specie slays thousands upon thousands of sheep their appetites growing by what they fee on, and their numbers increasing in proportion to their prosperity. They alight on th backs of the sheep and tear the poor beast with their beak, going at once down through the carcass to the kidney fat, whic to the owl's tongue is the daintiest of morsels.—N. Y. Dispatch.

COINS AS DISEASE DISSEMINATORS

That the small coins of all nations may be a most potent factor in disseminatin disease is a discovery due to the researche of Dr. Reinch. Taking the specimens o coin which had been long in circulation h scraped off the thin organic incrustations which he then divided into small pieces an dissolved them in distilled water. Microscopic inspection of the solution disclose abundance of bacteria and vegetable fung After this there is ample reason for cautio in handling money made of metal; of th danger of filthy paper currency the public has long been aware. Application to coins of a boiling weak solution of caustic potash will, however, free them of their organic impurities. Withdrawal from the circulation of old, dirty dollar bills and replacing them by new ones is perhaps the best way to prevent paper money acting incidently a not considerable role in the mechanism of epidemics, as well as of mercantile exchange directly.

RED AND PURPLE RIBBONS SUPPRESSED.

In consequence of a letter written by Examiner Antisell, of the Patent Office, the secretary of the treasury has ordered the use of red and purple ribbons in the government type writers to be discontinued in preparing papers intended for permanent record.

In reply to queries of the acting secretary of the United States treasury, the examiner says: There are ten different ribbons used, five being copying ribbons, and five record ribbons. The word "permanent" which appears in the inquiries presented, should be understood as referring to power of resisting obliteration by the action of light, of washing, of treatment with acids and alkalies, as ordinarily practiced by those operating to remove the ink. The color of the ink may be changed by such treatment (as from blue to black, black to green, and other similar changes of shades), but, whether change of color be produced or not, the ink is not effaced; it is legible, the letters are not obliterated, and therefore such ink may be said to be permanent. This is eminently true of black record ribbons. Another ink is furnished, called the black indelible copying ink, which has also the above-mentioned properties of permanence.

The ribbons of other color than the foregoing are . . . found to be fugitive—red and purple particularly so. They, for this reason, should not be used for recording permanent records. These inks cannot be styled permanent. It may be stated here that the same ink has different results as it is applied on paper by the ordinary writing pen and as applied to similar paper by the type writer; in the latter instance, from its soaking more deeply by the impact of the machine, and being forced below the surface of the paper, it is more difficult to be removed or reached by chemical agents applied; therefore, an advantage accrues in the use of the type writer over the pen. "Are copies made on the type writer by the use of carbon paper permanent in their nature? may be answered as follows: If these carbon paper copies do not require to be frequently referred to, they may be said to be permanent in their nature. Owing to light pressure upon the paper, the ink is not deeply embedded, and may be easily removed by friction. This appears to be an objection to the use of carbon paper. In all cases where permanence is desired, the paper should be as thin as may be consistent with its cohesive strength, and bearing as little thickening material or size as possible.

GOLD UNDER PHILADELPHIA.

It has long been well understood that gold is the most universally distributed of metals, being found in all parts of the world, but most readers will probably be surprised at a statement recently made by Prof. A. E. Foote, of this city, to the effect that there is more gold in the clay under the city of Philadelphia than would equal the entire valuation of the city. In 1812, men made sixty cents a day in washing the sands near Chester, on the Delaware River, where William Penn first landed, and quite recently several dollars' worth of gold in grains were taken from a well one hundred and fifty feet deep within twenty miles of Philadelphia.—Wood and Steel.

HOW OLD SOL USED TO SHINE.

In 1303 and 1304 the Rhine, Loire and Seine ran dry. The heat in several French provinces during the summer of 1705 was equal to that of a glass furnace. Meat could be cooked by merely exposing it to the sun.

Not a soul dare venture out between noon and 4 p. m.

In 1718 many shops had to close; the theaters never opened their doors for three months. Not a drop of water fell during six months.

In 1773 the thermometer rose to 118 degrees.

In 1778 the heat at Bologna was so great that a great number of people were stifled. There was not sufficient air for the breath, and people had to take refuge under the ground.

In July, 1793, the heat again became intolerable. Vegetables were burned up and fruit dried upon the trees. The furniture and wood-work in dwelling houses cracked and split up; meat went bad in an hour.

ANCIENT RIVERS.

The ancient gravel channels of California were formed, it is believed, during the Pliocene period, and extend from Mariposa county in the south to Siskiyou county in the north, having an aggregate length of about 320 miles. The auriferous area has been estimated to be 200 square miles. These channels are from 200 to 400 feet wide on the bottom, and sometimes as much as 2,000 feet wide on the surface. They are filled with gravel from depths of 20 to 400 feet. The deposit at the bottom consists of boulders, cobbles, gravel and sand firmly cemented together. This bottom deposit is commonly known as the "blue lead" from its color, and varies in thickness from 20 to 120 feet. Above the "blue gravel" is found the "top gravel," consisting of sand and occasional boulders, with sometimes layers of pipe clay. Near the surface is found red soil, varying from a few feet wide to 20 feet in thickness. Gold is distributed very uniformly through the entire mass of gravel, being most abundant near the bed-rock. These ancient channels are sinuous in their course and have many branches and tributaries. Their grades vary from 20 to 300 feet per mile—sometimes confined within narrow banks and again assuming lacustrine proportions. They undoubtedly carried more water than do the present rivers of California. The fact of the material being coarser and larger at the bottom is due to the great velocity of the rivers where confined to narrow channels. As the filling increased the transporting power of the streams became less from the diminished depth of the water, and hence the latter deposit was of firm material.

The principal gravel mines of California are situated in the counties of Yuba, Sierra, Placer and Nevada, in the region drained by the Feather, Yuba and Bear rivers. It has been estimated from careful canvass of this industry, that there are on the drainage system of these rivers 300 mines or tracts of mining lands which have been worked within the past three years, though not, perhaps, simultaneously, by the method distinctively known as "hydraulicking," besides numerous "drifts," "rivers" and placer mines, which are dependent upon water washing. The magnitude of these mines, whether hydraulic or drift, depends on the width and length of the channel.—W. A. Skidmore, in Mining Review.

THE TORONTO ELECTRIC RAILWAY.

The electric railway now being operated by the Toronto industrial Exposition is a perfect success. It is something entirely new, and differs from the one run here last year. It is not a toy or an experiment, but a practical railway, carrying the visitors to and from the fair grounds, making connections with the horse cars. When it is considered that the maximum of power used was only thirty-horse power, and that the number of passengers carried on Saturday last was nearly six thousand, and yesterday ten thousand, it is truly wonderful. The motor, which is one of the latest improvements of Mr. Van Depoele, is placed upon one of the cars and is connected to the axles. It is controlled, and made to run fast or slow as desired. The electric current is conveyed to the motor through an overhead one-fourth inch copper wire; it passes into a small copper wheel which is on top of the car, and presses against the under

Sahara, also, there are larvæ which are used by the natives as food.

NEW APPLICATION OF IRON.

According to the San Francisco Chronicle, an inventor in Stockton, California, has discovered a new process of preparing iron, which is said to make a metal tougher and more elastic than steel. The material is to be known as cast wrought iron. It is a composition of which 70 per cent is cast iron, most of the carbon being taken out. Its manufacture costs from six cents to seven cents a pound, and the iron can be made in any ordinary iron foundry. It is said to be the strongest ever made, 100 pounds of it giving three times the strength of 150 pounds of cast steel. It is claimed that besides being tougher, stronger and more elastic than cast steel, the new metal can be easily forged without the slightest danger of chipping off. Under the lathe the metal gives a shaving similar to that of wrought iron and presents a smooth, close-grained surface. The peculiar qualities of the new substance, it is asserted, make it superior for machinery, as it can be made lighter and yet possess the required strength.

TORNADO PREDICTIONS.

Mr. William A. Eddy, the tornado expert of the Signal Service Bureau, calls attention to the fact that the study of the phenomena of tornadoes has advanced so far that predictions of the appearance of these terrible destructive agencies can be made with a considerable degree of accuracy. Of thirty-eight predictions that tornadoes would occur in April and June of last year, eighteen were verified; of nineteen predictions in June and July of this year, fifteen were generally verified, and where regular tornadoes failed to arrive, violent wind and hail storms partially fulfilled the prophecy. Mr. Eddy thinks that a system of tornado signals should be established at every telegraph station in the tornado states. If the Government will do this much, at least some of the terrible loss of life and property due to tornadoes, can be averted. The facts presented by Mr. Eddy fully warrant the small appropriation by Congress which will be necessary to establish such a system of signals.

A NEW GOLD-LIKE ALLOY.

The Chemical News, of London, calls attention to the fact that a new alloy, resembling gold in appearance, weight, and in withstanding the jeweler's test of strong acids, is extensively manufactured in England, chiefly, Mr. Lowe naively states, for the purpose of defrauding pawnbrokers, to whom articles of jewelry made of it are frequently offered in pledge. Mr. Lowe examined a bracelet that had been sold as gold to a gentleman in Liverpool. After scraping off the gilding, the article had the color of nine-carat gold. It was found on analysis to have the following composition:

Silver	2.48
Platinum	32.02
Copper (by difference)	65.50
Total	100.00

He adds that strong boiling in nitric acid, even when the article was left in it for some time, had apparently no effect upon the alloy. The alloy is called "mystery gold."

WEIGHT OF COIN.

The standard gold dollar of the United States contains gold of nine-tenths fineness 25.8 grains, and the standard silver dollar contains silver of nine-tenths finenesss 412.5 grains. One million standard gold dollars, consequently, weigh 25,800,000 grains, or 53,750 ounces troy, or 4,479.16 pounds troy of 5.760 grains each, or 3,685.71 pounds avoirdupois of 7,000 grains each, or 1,863-1,000 "short" tons of 2,000 avoirdupois each, or 1,645-1,000 "long" tons of 2,200 pounds avoirdupois each. One million standard silver dollars weigh 412,500,000 grains, or 859,375 ounces troy, or 71,614.58 pounds troy, or 58,628.57 pounds avoirdupois, or 29,464-1,000 "short" tons of 2,000 pounds avoirdupois each, or 26,307-1,000 "long" tons of 2,240 pounds avoirdupois each. In round numbers the weight ture also picked up by the air in its passage through the hot water acts as a lubricant for the side valves and pistons.—Railway and Tramway Express.

SCIENCE AND THE GOVERNMENT.

Frank Wigglesworth Clarke notes the growing dependence upon scientific methods as a noteworthy feature of modern civilization, and finds in our national administration an amazing development in certain lines of scientific industry. Every executive department either has scientific experts connected with it, or employs such experts at times to conduct its investigations. There is a considerable demand for science in the defensive branches of the public service, such as the army and navy. The weather service uses the electric light to great advantage. The Department of Agriculture applies scientific research to the assistance of great industries. The Mint and Assay Offices has much to do with chemistry. The geological surveys develop more fully the principles of geologic science, and from an economic point of view investigate our mineral resources. The Patent Office reveals the fact that the Government has become the arbiter in doubtful questions of scientific priority. Scientific work is also frequently carried on at Government expense, which aims at the discovery of truth for its own sake, like the expeditions to observe the transit of Venus and the solar eclipse, as well as service rendered by the Beareau of Ethnology.

A LITTER OF BABIES.

A correspondent of the Cincinnati Enquirer relates the following:

"A remarkable story comes from Henry county, just west of this city, (Toledo) which, if it were not thoroughly substantiated, would be almost incredible. It is to the effect that several days ago the wife of Wilhelm Freund, a German farmer, living about half a mile from Holgate, gave birth to five children, all boys, and that all the infants are well formed and alive. When the Enquirer correspondent investigated this stupendous increase in the census he found that the event is but one of a series that have happened in this interesting family. Mrs. Freund is 36 years of age, and during her nineteen years of married life has given birth to twenty-one children, eighteen of whom are now alive. The other three lived to various ages over a year. Dr. Townsend, of Holgate, has been in attendance at most of these events, and Dr. Harrison, of Napoleon, is also conversant with the facts and has assisted on some occasions. The mother is described as a comely German woman, raw-boned and spare, and the father short and solid, but not portly. This happy couple live on a small farm, which the husband tills with the assistance of his numerous progeny. Some of the children, it is said, were born in the hay-field where the mother was at work."

INSECTS AS FOOD.

Locusts, so much dreaded by the farmers of all the civilized countries, are welcome in Arabia, and China, whose inhabitants look upon fried grasshoppers as a most favored dish. Livingston, the famous traveler, saw some tribes in Africa, who preferred buns of meal made from dried insects like our mosquito. Dr. Sneider, of Denmark, describes two other insects used as food. The mountain rivers and brooks of Chili abound in minute water beetles (Elmis Condimentarius) which are fished out by the natives in large quantities. After being dried, these beetles are used as a condiment known under the name of shishee. Shishee sauce is much valued in Chili and Peru. In the salt lakes of Nevada there are found millions upon millions of the larvæ of a fly known as Ephydra Californica. In July, when the larvæ are fully developed, the Indians collect them on the shores, dry them in the sun, and then squeeze them with their fingers. Thus they get a kind of grain which looks like rice of yellowish hue, which is ground into meal. From this meal the redskins prepare an excellent broth. In the lakes of Egypt and minutes to live, according to his calculation. He did look like a man on the verge of eternity. His eyes were dim and sunken, his face had that peculiar pallor which heralds the near approach of death, and his breathing was very labored. The family were gathered around and weeping as they took a final leave. Something had to be done quick. There was a smart-looking woman there, and I called her aside. Pointing to the clock on the mantlepiece, which the patient was watching, I said: 'When I have his attention, turn that ahead.' Then I crowded into the family group, bustled them into the next room, sat down on the edge of the bed and began telling that fellow one of the most horrible murder stories you ever heard. I located it right in the town where he knew everybody, named the woman killed, went into blood-curdling details, and so completely interested the man that he forgot his eleven o'clock appointment. When I gave him a chance to look again it was twenty minutes to twelve, and he was actually mad for a time, claiming that he had been tricked. He finally got to laughing, and we all took dinner together. The next day he whipped two men at a barn-raising for twitting him about the programme of death that miscarried."

THE LAW OF FINDING.

The law of finding, says a writer, is this: The finder has a clear title against the world, except the owner. The proprietor of a coach, or a railroad car, or a ship, has no right to demand the property on a promise. Such proprietors may make regulations in regard to lost property which will bind their employes, but they cannot the public. The law of finding was declared by the king's bench 100 years ago, in a case in which the facts were these: A person found a wallet containing a sum of money on a shop floor. He handed the wallet and contents to the shopkeeper. The latter refused to deliver them upon the ground that they were found upon his premises. The former sued the shopkeeper, and it was held as above set forth, that against all the world but the owner, the title of the finder has been held to stand in the place of the owner, so that he was permitted to prevail in an action against a person who found an article which the plaintiff had originally found, but subsequently lost. The police have no special rights in regard to articles lost, unless those right are conferred by statute. Receivers of articles stolen are trustees for the owner or finder. They have no power in the absence of special statute to keep an article against the finder, any more than a finder has to retain an article against the owner.

COMMERCIAL RELICS OF ANCIENT ROME.

An interesting discovery illustrating the commerce and the luxury of ancient Rome has been made close to Monte Testaccio and the English cemetery. The whole of that district to the west of the Aventine outside of the Porta Tregemina was occupied by granaries and warehouses for the storage of imports of all kinds. Between the northern side of Monte Testaccio and the Tiber there still exist colossal remains of the great emporium built by Marcus Emilius Lepidus and Emilius Paulus nearly 200 years before the Christian Era. In the year 1868 a considerable portion of the quays was discovered, together with some 600 blocks, many of them of large size, of rare, variegated marbles of all kinds, lying just where they were landed from the galleys which had brought them from Numidia, the Grecian Islands, and Asia Minor, fifteen centuries ago.

Now, in the course of the building operations in this locality, two warehouses have been discovered, one filled with elephants' tusks and the other with lentils. It is curious to find such product stored side by side; but as bags of lentils were sometimes shipped as ballast, they may have served that purpose. The discovery would have been a very valuable one if, unfortunately, the ivory had not been much decayed.

REMARKABLE DREAMS.

Among the most remarkable dreams on record the following will always have their place:

Breakfasting with some ladies on Wednesday, November 25, 1779, at his house on Hill street, London, Thomas, Lord Littleton, spoke of a very curious dream he had dreamed in the night. In this dream a bird flew into the room where he was and while he looked at it, it changed into a woman, who told him to prepare for another world, as in three days he would die. He was then well, and, as he laughingly said, he did not look like a man so near death. On the Saturday also, he felt perfectly well, and believed he should "bilk the ghost."

Some hours afterward he went with Mr. Fortesque and Captain Wolsely to Pitt Place, Epsom, ate for supper an egg, went cheerfully and talkatively to bed, hoped he should have good rolls for breakfast and suddenly expired, while Stucky, his servant, was assisting him to remove his under waistcoat. This story has been told in various ways. The above account is that given by Lord Westcote, Lord Lyttleton's uncle.

John Aubrey tells that a poor cloth-worker's wife, living in Gilford, named Abbott, dreamed that if she would eat a jack, her son, who was about to be born, would grow up and become a great man. Early the next morning she went to the river for water and caught in her pail a fine jack, which she cooked and ate—all or nearly all. The child was born, grew up, became a scholar in the town, and finally became Archbishop of Canterbury—of course through his mother eating the fish, or so thought John Aubrey, F. R. S.

Vouched for by tradition and history the strange dream of the Swaffham tinker has a fair claim to rank with the wonderful dreams to which this article is devoted. The story of it runs as follows:

About three hundred or more years ago, the above named ancient town in Norfolk, remarkable of old for its healthiness and beauty, had among its inhabitants an industrious, hard-working tinker named John Chapman, traditionally said to have been the beneficent builder of the north aisle of Swaffham Church. Certain it is that in the north aisle there are various devices of a peddler and his dog, and of a shop-keeper or Chapman, which seems like a rebus upon the traditional name, a species of conceit prevalent in ancient times. Certain also, it is, that in 1462 the name of one of the church wardens was Chapman, and that in each of the original windows of this aisle was a painting of the tinker, his wife and three children.

One night the tinker dreamed that if he went to London and stood on London bridge he would there meet some one who would make his fortune and put and end to all the weary wanderings over hill and dale in search of work. Deeply impressed by this dream he spoke of it in the morning to his wife, so seriously and with such an evident belief in it, that she both scolded and laughed at what she called his folly. Strangely enough, as the tinker thought, the dream which had haunted his mind all day was repeated on the next night; and the impression, thus deepened and strengthened, not unnaturally brought a third repetition of it on the night following, after which John was no longer withheld from going to London.

Despite the remonstrance of his friends, the entreaties of his wife, and the ridicule of his neighbors, the tinker set out to travel all the way afoot, a distance of not less than ninety miles. At the close of the third day he reached the end of his journey, slept at an inn, and early in the morning stationed himself on London Bridge, at a spot which he remembered was that pointed out to him in a dream. And there he remained all day, eyed curiously by the passers-by and suspiciously by the shopkeepers who lived on the bridge and by the keepers of its gates, which closed at a certain regular hour to guard the city fron evil characters, on which the Bankside and other parts of Southwork had a larger share than was good for its reputation. Nothing was, however, said to him that appeared to be in any way connected with his dream.

The experiment was repeated on the second day with no other result than that of intensifying the curiosity and suspicion which he had provoked on the first day. But after he had passed the third day on the bridge, and the evening gloom, which warned him of the closing gates, was again upon him, one of the shopkeepers, who had eyed him wonderingly on each previous occasion, ventured to ask him what possible reason he could have for standing there every day and all day long. The tinker confessed that he had been induced to make a fool of himself by a very singular dream. The stranger laughed at him heartily. "If I had been as credulous as you are," said he, "I should be on just such another fool's errand; for three nights this week I dreamed the same dream, and in it I was told to go to a place called Swaffham, which I find is ninety odd miles away. I thought in my dream that under an apple tree in an orchard on the north side of the town I was told to dig, and that there I should discover a box full of money."

After some further questions and answers on either side they parted; and the tinker, saying nothing of the place he had come from, went away again hopeful and with restored cheerfulness and faith in his dream, set out early the next morning for home. One of the first things he did on reaching it was to visit the orchard indicated by the stranger's dream. He recognized it at once by certain peculiarities of the tree he had asked the London dreamer to describe, and digging under it, soon laid bare the top of an iron box. To unearth this and convey it to his house unobserved was his next task, and this accomplished, it was opened and found to be full of money. Imagine his triumph and delight! On the outside of the box were some words, which, being unable to read, he did not know the meaning of. Afraid to make his secret known or arouse the suspicion, which might lead to unpleasant circumstances, he hit upon a plan for finding out what the words said. This was to place the box at the door of the grammar school, so that its inscription might be read by the boys as they came out and while he stood by, as if by accident. The boys soon gathered round the box, and one scraping the dirt and rust from the inscription, read, doubtless amongst much laughter, the apparent meaningless lines:

Where this casket stood
Is another twice as good.

Hearing these significant words, John Chapman went away, hardly able to restrain his exultation and pleasure, and early next morning he was again digging in the deserted orchard, where his efforts were rewarded by the discovery of a second casket, twice as large as the first and equally well filled.

LINCOLNSHIRE DIALECT.

Our American customs of calling the prong of a fork a tyne is a Lincolnshire peculiarity, and came over with our forefathers. The more general word prong is indeed driving it out, but a tyne is understood in Lincolnshire alone. The older men here distinctly remember the pronunciation of nature and creature, natur and critter, just as they were pronounced in New England fifty years ago. Perhaps the most amusing of these local peculiarties is the old-fashioned Lincolnshire way of calling a cucumber a cowcumber, which the older readers of The Courant will promptly recall as common in their childhood. So, too, the quaint archaism which many of us so well remember of calling a cow a caow, and a pound a paound, remains in full force not only in Lincolnshire, but has extended throughout England, and may be called the accepted pronunciation of the diphthong ou. I hear it not only in the cathedral pulpits, but on the lips of the shop boys. It has survived in Philadelphia and perhaps elsewhere with us, but it has mainly been laughed out of New England.

But to me the most interesting connection between Lincolnshire and New England pronunciation is the little word "been." It has long been a wonder to me how and why that word should be pronounced not only in New England, but throughout the

United States, so differently from what it is in England, Scotland, Ireland, Canada, Australia, Nova Scotia, South Africa; it is made to rhyme with seen and between, whereas in our country it is made to rhyme with sin and din. It was all explained when I came to Lincolnshire and found that the old local usage there was to call it bin, and that it is not entirely driven out to this day. I have not been able to trace that other old-fashioned pronunciation of the same word, "ben;" I could not find it in Lincolnshire. But many words which the older people will remember as now mostly gone by, such as put with a short u, pretty pronounced puhty, and purty, heard pronounced heerd, I find well remembered in Lincoln and Boston.—Hartford Courant.

TURQUOISE.

The first historic record of turquoise mining in Persia, occurs about the tenth century, A. D., and for ages has been one of the most important sources of wealth in this country. The Persian name for the stone is Firvoz, and the mines now worked are the same as those worked 800 years ago. They are found in Kerman and Khorassan, though the former are now almost abandoned, the light green color and early fading making them of small value. These mines are of great depth, and access to them is hazardous. The Persians and the people of the United States prize the darkest stones, while in Europe those of a fine light blue, of medium intensity are preferred. The former are more rare, and retain their color longer. Although in general, size has much to do with the value of a turquoise, color is the final test that fixes the price. There is a turquoise now in the bazaars, no larger than a pea valued at $800. All the mines of Persia are farmed by officers connected with the Persian government. They pay a yearly rental to the shah of 18,000 tomans, or $30,000. There are no other mines known in modern times that have produced stones of noted value, or in any quantity, except the mines of New Mexico.

The New Mexico mines are two in number, and are located about eighteen miles southwest of Santa Fe, in the Cerrillos mining district, being known as the Chalchuitl and Castillian. The history of the former mine is very interesting, associated as it is with the earliest Spanish conquests, where avarice and cruelty resulted in bringing about great loss of life and many reverses to the Spaniards.

This mine was probably largely worked by the Aztecs more than 300 years ago, so that in 1540, when Coronado and his followers penetrated into this country and captured (after a severe siege) the present city of Santa Fe, then a populous Indian village, their cupidity was aroused and enslaving their poor captives for more than 100 years the gloomy recesses of the mine were thickly populated by the hapless race, lashed by the most cruel of taskmasters.

The veins of turquoise in this mine run horizontally instead of vertically, as in the Castillian, and it was so extensively undermined in getting out the precious material that on one inauspicious day in 1680 the whole top of the mountain settled down, crushing and burying about eighty Indian miners. This terrible calamity, coupled with the fact that an effort was soon made by the Spaniards to re-open the mine, thus violating one of the fundamental principles of the Aztec faith, never to molest graves of kindred, so incensed the Indians that they rose in rebellion and successfully expelled their former conquerors from the country. Santa Fe was captured, many of the Spaniards were massacred, and the balance compelled to flee for their lives, the Indians being complete masters of the situation for a period of sixteen years. So intense was their hatred of the Spaniards that San Miguel church was leveled to the ground and everything portable taken to the plaza and burned near where the soldiers' monument now stands. It is believed that many historical and official documents that were in the governor's palace at the time were thus lost, and that valuable mines and springs were filled up and destroyed out of revenge.

1886.

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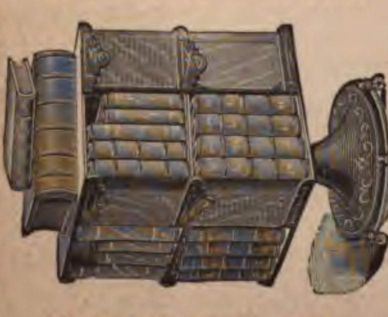

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FIG. 18.

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